[BART EXTENSION]

[Harrington and Chapman San Francisco]

1/4 BD
SEP
ENV I

Livermore-Pleasanton BART Extension Study

Final Report

Liverm

Livermore-Pleasanton BART Extension Study

Y4
Sep
Envi
bind in map

Final Report

6409-2409√
ENVI

LIVERMORE-PLEASANTON BART EXTENSION STUDY

FINAL REPORT

March 1975
Revised December 1975
Published July 1976

The preparation of this report has been financed in part through a grant from the U.S. Department of Transportation, Urban Mass Transportation Administration under the Urban Mass Transportation Act of 1964, as amended.

The contents of this report do not necessarily reflect the official views or policy of the U. S. Department of Transportation.

Prepared for LIVERMORE-PLEASANTON BART EXTENSION BOARD

LIVINGSTON AND BLAYNEY, CITY AND REGIONAL PLANNERS, SAN FRANCISCO
DE LEUW, CATHER & COMPANY, ENGINEERS, SAN FRANCISCO
A Joint Venture for Livermore-Pleasanton BART Extension Planning and Conceptual Engineering

Freebairn-Smith and Associates, Planning, Urban Design, Architecture
Keyser/Marston and Associates, Economists
Gruen Gruen + Associates, Sociological Consultants
William Goldner, Urban Economic Consultant
Robert H. Twiss, Environmental Planning
Woodward-Clyde Consultants, Consulting Engineers and Geologists

BOARD OF CONTROL

Members

Robert S. Allen
Director, Bay Area Rapid Transit District
Livermore

John Glenn
Director, Bay Area Rapid Transit District
Oakland

James D. Hill
Director, Bay Area Rapid Transit District
Walnut Creek

John H. Kirkwood
Director, Bay Area Rapid Transit District
San Francisco

William H. Parness
City Manager
City of Livermore

William Edgar
City Manager
City of Pleasanton

Joseph P. Bort
Commissioner, Metropolitan Transportation Commission
Oakland

Louise Giersch
Commissioner, Metropolitan Transportation Commission
Antioch

Donald F. Dillon
Commissioner, Metropolitan Transportation Commission
Fremont

Alternates

Richard O. Clark
Director, Bay Area Rapid Transit District
Oakland

Herbert Crowle
Director, Public Works and Road Commissioner
Alameda County

William H. Fraley
Director of Planning
Alameda County

PROJECT STAFF

William Hein
Project Director
Bay Area Rapid Transit District

Howard Goode
Project Coordinator
Bay Area Rapid Transit District

TECHNICAL ADVISORY COMMITTEE

Rita Friedlund
Planning Department
City of Hayward

Chien Change
Traffic Engineer
City of Hayward

Jim Cutler
Senior Planner
Planning Department
Contra Costa County

George Musso
Director
Planning Department
City of Livermore

Alan Campbell
Director
Public Works Department
City of Pleasanton

Robert Harris
Director
Planning Department
City of Pleasanton

Daniel Lee
Director, Public Works Department
City of Livermore

Mark Kermit
Deputy Public Works Director-
Transportation
Public Works Department
Contra Costa County

Edward H. Meyer
Public Works Department
Alameda County

Betty Croly
Planning Department
Alameda County

Douglas Nelson
Valley Community Services District
Dublin, California

T.M. Blalock
Public Services Department
City of Fremont

Ed Peabody
Planning Department
City of Walnut Creek

Lee Thompson
Public Works Department
City of Walnut Creek

Donald Morgan
Transit Coordinator
Metropolitan Transportation Commission

Don Miller
Division of Highways, District 4
California Department of Transportation

D.J. Callaghan
Air Pollution Control Officer
Bay Area Air Pollution Control District

dward H. Meyer
ublic Works Department
lameda County

etty Croly
anning Department
lameda County

ouglas Nelson
alley Community Services District
ublin, California

.M. Blalock
ublic Services Department
ity of Fremont

d Peabody
lanning Department
ity of Walnut Creek

ee Thompson
ublic Works Department
ity of Walnut Creek

onald Morgan
ransit Coordinator
letropolitan Transportation Commission

on Miller
ivision of Highways, District 4
alifornia Department of Transportation

.J. Callaghan
ir Pollution Control Officer
ay Area Air Pollution Control District

CITIZENS ADVISORY COMMITTEE

f HE4491
S45L58
1976
ENVI

Livermore

Chester Andersen
Ruben Pena
Bob Olson
F.V. Harshbarger
Robert Allen
Gilbert Marguth
Paul Brown
Valerie Raymond

Pleasanton

Glenn Hage
Bernice Oakley
Victor Bailey
Cecil Alberts
Nelson Williams
Alva Johnson
Joseph Madden

Castro Valley

Harry Kohl
Arthur Emmes

Walnut Creek-Danville

Larry Smith, Jr.
Larry O'Brian

Dublin-San Ramon

C.E. Campbell
Meade Telfair
Don Willhalm
C.A. Becraft
Robert Yolland
G.W. Abernathy

CONTENTS

TABLES

FIGURES

PURPOSE AND SCOPE

The purpose of this report is to present the findings of a study of alternate routes for the extension of BART rail rapid transit to Pleasanton and Livermore. Alternative corridors and routes in the Livermore-Amador-San Ramon Valley were analyzed, and a comprehensive evaluation of their impacts was prepared. Once a single route had been selected, it was compared with a bus alternative in order to determine what the critical differences are between bus and rail service to the Valley. In choosing the most appropriate route for a BART extension, the implications for growth and development and environmental impact had to be examined carefully. Implementation alternatives affecting the timing of construction of BART and related public improvements as well as land development near stations also were analyzed. The final products of this study are a conceptual engineering design of the selected BART line, station site plans, support facilities plans, and an implementation program. The refined impact analysis, including the comparison with the express bus alternative, also is presented.

This extension study is part of a broader regional transit planning effort being conducted in the San Francisco Bay Area. Related studies of BART extensions include the Pittsburg-Antioch Extension Study, the Northwest San Francisco Extension Study, the Golden Gate Corridor Study, the San Francisco Airport Access Project, and the San Mateo County Transit Development Project. The recommendations of each of these studies will be evaluated for inclusion in the Regional Transportation plan and 10 year estimate of regional needs being prepared by the Metropolitan Transportation Commission (MTC). Decisions on the best use of available funds for transit investments and on equity questions — who benefits from and who pays for transit improvements — must be made by MTC in a regional context.

To date, BART has recognized the need for rapid transit serving the Valley but has not made a long-term commitment on the type of service. Implementation and financing also will be the subject of a subsequent study prepared by BART and MTC that considers the extension studies in the context of regional transportation planning and funding priorities. The present report deals only with transit connections to the Valley and does not consider the relative merits of transit projects in other parts of the region.

ORGANIZATION OF THE STUDY

Overall responsibility for the Livermore-Pleasanton BART Extension Study is vested in the 9 member Livermore-Pleasanton BART Extension Board of Control, composed of 4 BART Directors, 3 MTC Commissioners, and the city managers of Pleasanton and Livermore. The Extension Board was responsible for consultant selection and made the final decisions on corridors and routes to be studied in each phase of the project. Both a Citizens' Committee and a Technical Advisory Committee were organized to assist in the study by reviewing the consultants' reports and making independent recommendations to the Extension Board. The Board, however, has the responsibility of resolving all of the issues raised and making the final decisions. The Technical Advisory Committee is composed of staff representatives of the cities of Hayward, Livermore, Pleasanton, and Walnut Creek, Alameda County, Contra Costa County, California Department of Transportation, Bay Area Air Pollution Control District, Metropolitan Transportation Commission, and BART. The Citizens' Advisory Committee is composed of interested citizens primarily from the Valley communities of San Ramon, Dublin, Pleasanton, and Livermore. To facilitate analysis of the issues, the Citizens' Committee formed five sub-committees: Growth and Development, Finance, Corridor Selection, Valley Lifestyle, and Transportation Service. Sub-committee reports were written to assist the consultant in selecting alternative routes and evaluating their impacts.

The two principal members of the consultant team are Livingston and Blayney, City and Regional Planners, and DeLeuw Cather & Company, Engineers and Planners. Several other firms made specific specialized contributions to the study. R.T. Freebairn-Smith was responsible for evaluating visual and physical fit of BART routes and stations and urban design potential in station areas. Keyser/Marston and Associates conducted preliminary economic analyses of development potential at alternative station sites. Robert H. Twiss, Professor of Environmental Planning at the College of Environmental Design, University of California, Berkeley, examined environmental impacts. Woodward-Clyde Consultants, Engineering Geologists, conducted geologic and soils studies. William Goldner, Urban Economist at the Institute of Transportation and Traffic Engineering, University of California, Berkeley, evaluated the capability of the PLUM regional growth model to test the

more-Pleasanton
the 9 member
ion Board of Con-
, 3 MTC Commis-
leasanton and
as responsible
he final decisions
ed in each phase
mmittee and a
e organized to
e consultants'
commendations to
however, has the
e issues raised
ie Technical Ad-
aff representatives
e, Pleasanton, and
ntra Costa County,
tation, Bay Area
opolitan Trans-
The Citizens'
f interested citizens
ties of San Ramon,
. To facilitate
' Committee formed
Development, Fin-
ifestyle, and
mittee reports were
selecting alterna-
pacts.

consultant team are
Regional Planners,
ngineers and Plan-
pecific specialized
Freebairn-Smith
ual and physical
d urban design
/Marston and Asso-
omic analyses of
ve station sites.
vironmental Planning
sign, University
l environmental
ltants, Engin-
logic and soils stud-
nomist at the Insti-
Engineering, Uni-
evaluated the cap-
th model to test the

impact of BART on development. Gruen Gruen + Associates designed and conducted a random sample attitude survey of households in the study area to determine reactions to BART alternatives.

Abstracts of the six preliminary reports published during the course of the study (Issues, Data, Evaluation Criteria, Preliminary Alternatives, Final Alternatives, and Recommended Route), and the report on the household attitude survey findings are included in the Appendix.

PLANNING PROCESS: AN OVERVIEW

The process of selecting the best route for a BART extension involved three phases, each composed of three distinct steps. First, alternatives were generated; second impacts and performance measures were predicted, and third, impacts were evaluated and alternatives compared. This "search and selection" procedure was designed to address the issues initially identified and reviewed with the Citizens' Advisory Committee, the Technical Advisory Committee, and the Board. An evaluation system based on a set of planning objectives derived from the issues was employed to screen out less desirable alternatives and to permit progressive refinement of the remaining routes and stations under study. The diagram on the following pages shows the relationship among these phases.

Because transportation problems cannot be examined in a vacuum with reference only to user costs and benefits, it was essential to examine the alternatives in the context of local growth and development alternatives. The specific options considered and the baseline conditions assumed are presented in the Framework for Analysis chapter.

Route and station alternatives were generated by both intuitive and systematic searches. Early in the study, all corridor access routes to the Valley were identified and checked for engineering feasibility. Station locations to serve areas of apparent high trip generation in the Valley were located and combined into logical route alternatives. The impacts of these candidate Valley BART stations then were predicted and evaluated. The results were used as inputs into the next cycle during which alternative Valley routes were generated and evaluated. The criteria used in the evaluations, described in the Framework for Analysis chapter, dictated the number and type of impacts to be evaluated. Concurrently, all possible corridors were defined, selected impacts predicted, and a preliminary evaluation conducted. In the next cycle for corridor studies, route alternatives within the corridors were examined, and further impacts were predicted.

The results of these preliminary evaluations were inputs for the generation of six preliminary line alternatives through two corridors. Impacts of these preliminary alternatives that had not been evaluated then were predicted, and the initial evaluations were re-examined. Following publication of these findings in the Preliminary Alternatives report, the Board requested additional studies in the San Ramon Corridor, particularly of additional downtown stations in Walnut Creek. The conclusions of these studies were presented in the Final Alternatives report.

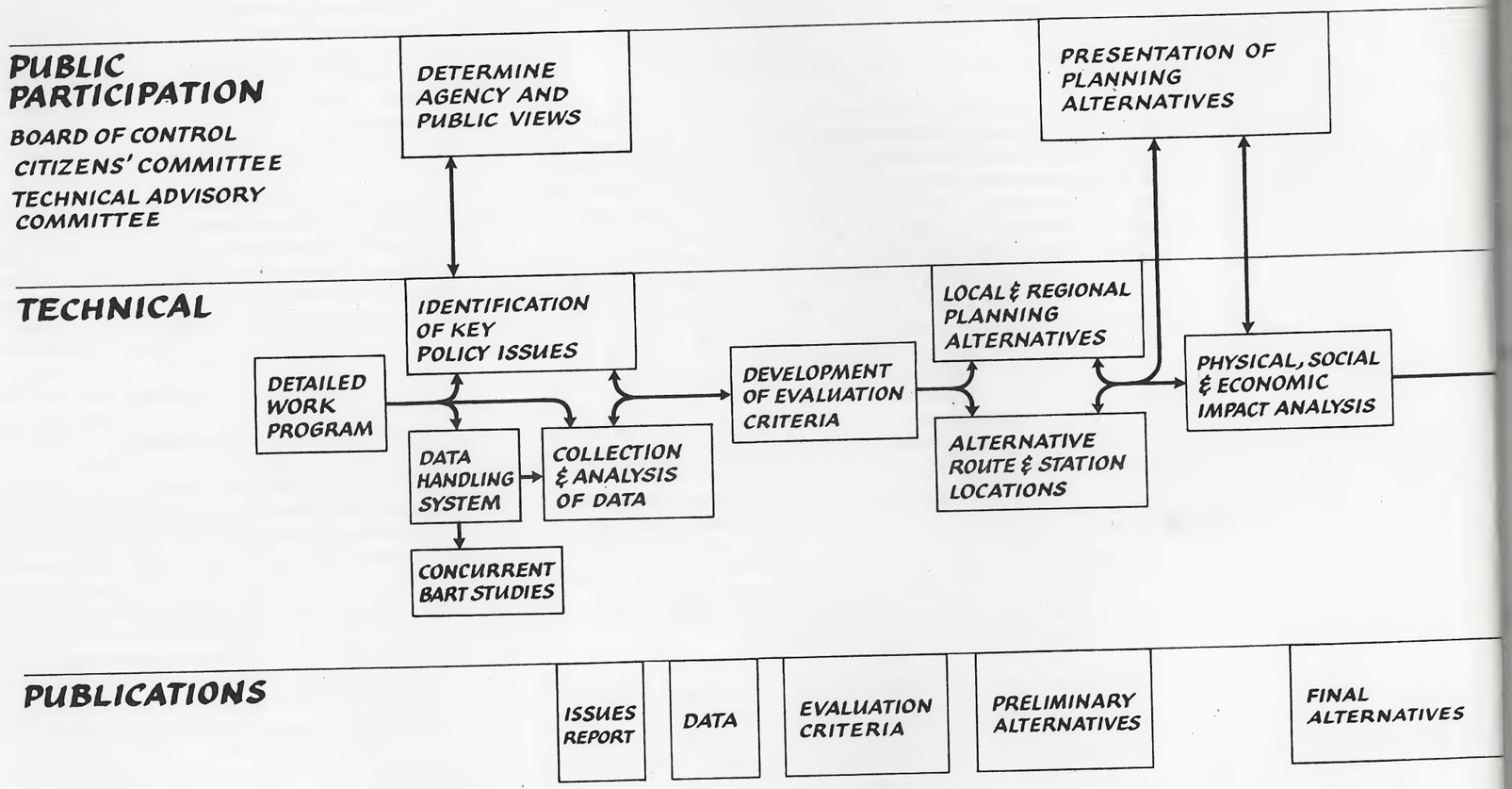
In the alternative evaluation phase, corridor planning issues and Valley planning issues were studied separately for two reasons. First, a corridor decision is separable from a decision on a Valley route because most of the Valley alternatives could be joined to the existing BART system through any corridor. Second, costs, traveler benefits, growth, and urban environmental impacts of a BART line in the Valley would vary depending on the corridor selected to tie into the existing BART system, so it was logical that a corridor decision be made first.

Following the Board's selection of a single BART route based on the Recommended Route report, conceptual engineering for that line was completed. This included refining earlier studies and preparing the plan and profiles and typical sections, station site plans, and plans for support facilities. Earlier evaluations also were refined based on the detailed plans, and a comparison with an express bus service alternative through Dublin Canyon was made. During this phase, the environmental impact assessment was reviewed in relation to State and federal requirements.

Finally, in the implementation program, opportunities for local development coordination with a Livermore-Pleasanton BART extension were analyzed along with financing mechanisms for BART station area development. The needs for early right of way acquisition, staging of public improvements, and regional and local transit service coordination with a BART extension also were examined. BART staff evaluated alternate means of financing a BART extension for the Valley.

Livermore-Pleasanton BART Extension Study

PLANNING PROCESS



ALTERNATIVE EVALUATION PHASE

...sion Study

PRESENTATION OF PLANNING ALTERNATIVES

...OCAL & REGIONAL ...LANNING ...LTERNATIVES

PHYSICAL, SOCIAL & ECONOMIC IMPACT ANALYSIS

...ALTERNATIVE ...ROUTE & STATION ...OCATIONS

PRELIMINARY ALTERNATIVES

FINAL ALTERNATIVES

...SE

PUBLIC HEARINGS ON FINAL ALTERNATIVES

PUBLIC HEARING

ESTIMATION OF REVENUE & PATRONAGE

FINANCING AND IMPLEMENTATION

FINAL ROUTE SELECTION BY BOARD

CONCEPTUAL ENGINEERING OF SELECTED ROUTE AND STATIONS

SUPPORT FACILITIES PLANS

REFINED IMPACT ANALYSIS OF ROUTES, STATIONS AND SUPPORT FACILITIES

BUS ALTERNATIVE

EVALUATION OF BART VS. BUS

CONCEPTUAL ENGINEERING & SITE PLANNING DRAWINGS

FINAL REPORT ENVIRONMENTAL IMPACT STATEMENT

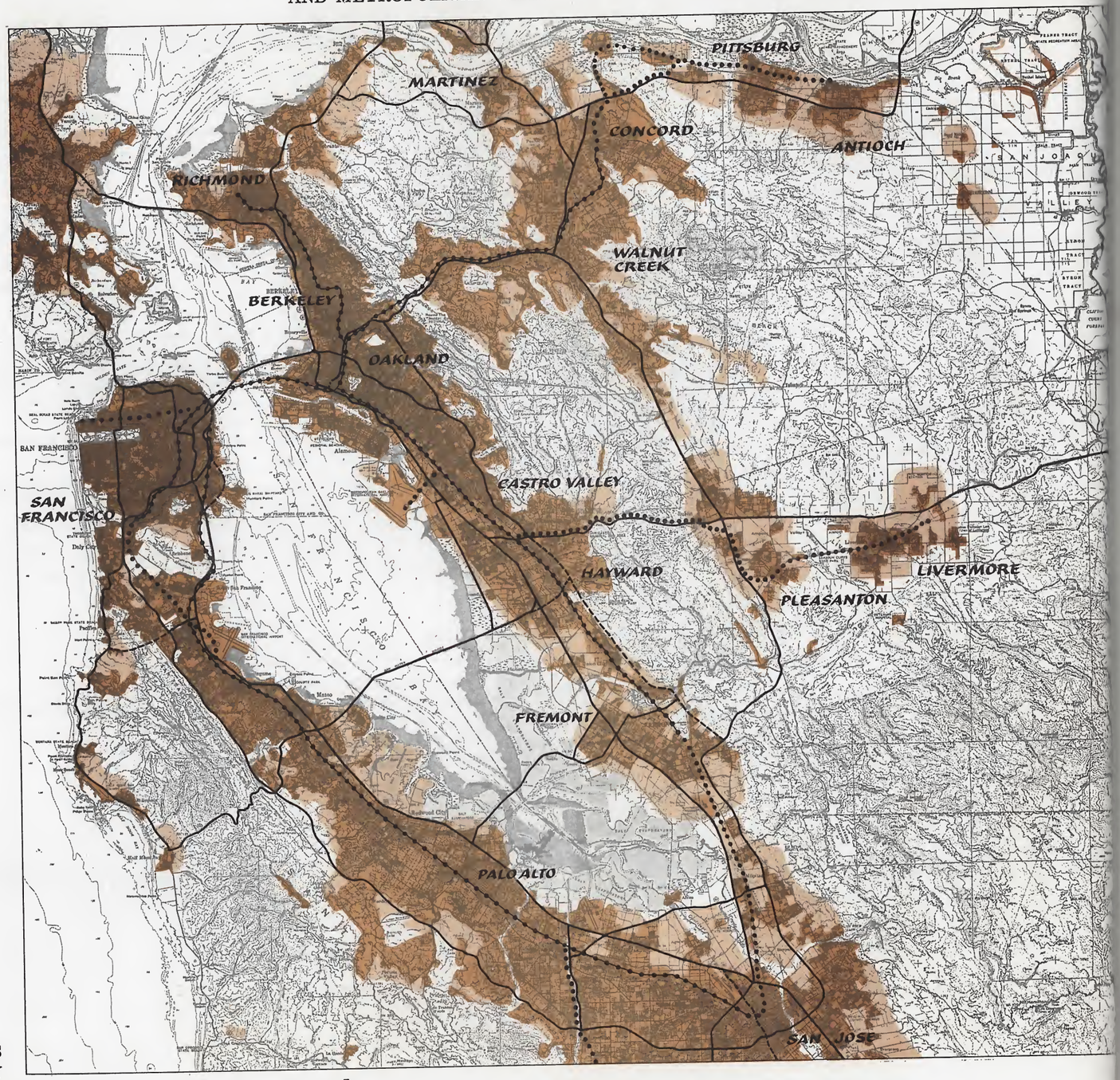
SUMMARY

...LAN SELECTION PHASE

CONCEPTUAL ENGINEERING PHASE

Regional Development

MAP BASED ON ASSOCIATION OF BAY AREA GOVERNMENTS REGIONAL PLAN DIAGRA
AND METROPOLITAN TRANSPORTATION COMMISSION REGIONAL TRANSPORTATION PL



1970 DEVELOPED SPACE

1990 DEVELOPED SPACE

REGIONAL HIGHWAYS

CORRIDORS UNDER STUDY

REGIONAL RAIL TRANSIT

RAIL TRANSIT EXTENSIONS UNDER STUDY

EA GOVERNMENTS REGIONAL PLAN DIAGRA
COMMISSION REGIONAL TRANSPORTATION PL

REGIONAL PLANNING ISSUES

The concerns in planning a Livermore-Pleasanton BART extension go beyond service to the residents of the Valley to the larger question of the effect of transit investments on the distribution of activities in the Bay Area. Rapid transit impact studies in the Bay Area and elsewhere generally have concluded the distribution of population and employment growth may be affected by a transit system, but that net new growth in a region will not be stimulated. If alternative BART choices will affect the amount of population or employment growth at locations outside the Valley, even though the magnitude may be small, the analysis should strive to identify the impacts.

The Livermore-Amador Valley is the only urbanizing portion of Alameda County that does not have BART rail service nearby. Express bus service to Bay Fair Station on BART's Fremont Line started late in 1974, but present service levels are intended only as a beginning. It is clear that the Valley's growing population will justify a higher quality connection to the regional transit system to which Valley taxpayers have made the same contribution as taxpayers elsewhere in the BART district. Whether this connection is made with a BART extension or an express bus system is one of the critical issues addressed in this study.

In 1972, Valley population (including San Ramon in Contra Costa County) passed 100,000 and is expected to double by 1990, barring a prolonged economic downturn or severe anti-growth restrictions. When Valley population reaches 227,000, as projected by 1990, about 44,000 residents will commute out of the Valley to work, while 18,000 will commute in and 36,000 Valley residents will hold local jobs. Currently, about three-quarters of the out-commuters use the Dublin Canyon corridor, but there are also commute trips in the San Ramon Valley and Niles Canyon/Mission Pass corridors.

Regional impacts to be considered in planning transit service to the Valley include:

- Effect of the type of transit service (BART or bus) on the rate of population growth and on out-commuting in the Valley.

- Effect of alternative primary transit corridors connecting the Valley to the existing BART system on transit usage and on employment distribution outside the Valley.

REGIONAL DEVELOPMENT ALTERNATIVES

If, as experience indicates, rail transit is best suited to carrying employees to areas of high employment concentration within walking distance of a station, then it increasingly will serve office workers who form a growing percentage of all employed persons. To the extent that the location pattern of regional office complexes is influenced by transit accessibility, a BART extension can reinforce current trends or give impetus to a change. In the Bay Area, the alternatives are to increase the concentration of regional offices in downtown San Francisco and, to a lesser extent in Oakland, or to promote the development of regional subcenters. The Association of Bay Area Governments' (ABAG) Regional Plan of 1970 advocates a city-centered concept consisting of a system of communities "large enough to be able to specialize economically", and suggests that "surrounding communities would be less dependent on the metropolitan centers." ABAG does not take a position on whether regional office employment should be centralized or decentralized.

Centralization of Office Employment

Recently, the momentum has been toward centralization of region-serving offices. During the early 1960's, San Francisco was adding less than 800,000 square feet of office space per year. Between 1968 and 1970, this increased to an average of 1.2 million square feet per year, and by 1973 the rate of increase was 1.6 million square feet and 9,000 jobs added each year. Between 1967 and mid-1971, 45 percent of the total value of office building permits in the nine county Bay Area was in San Francisco, The 20 year outlook in San Francisco is for addition of 1-1.2 million square feet of office space and 5,700-6,900 office jobs each year. Office employment gains will continue to be partially offset by the exodus of manufacturing and distribution industries to suburban locations. ABAG projects a net gain of only 57,000 jobs in downtown San Francisco between 1970 and 1990 (286,000 to 343,000). Oakland's central business district employment will increase by 45,000 according to ABAG (63,000 to 108,000).

Alternative Growth Projections

To test the impact of a deliberate increase in jobs in the northern Bay Area counties on land use patterns, ABAG made separate projections (called GRONORTH 2) of employment and population with the same regional totals using the Projective Land Use Model (PLUM). The baseline case (GROSOUTH 2) assumed a continuation of growth in the southern counties and increasing commute times between jobs and residences. In the GRONORTH alternative, however, the net decrease in downtown employment in the major cities is small, and the centralization of office employment continues. The 1970 to 1990 gain in jobs is 33,000 in downtown San Francisco (286,000 to 319,000) and 37,000 in downtown Oakland (63,000 to 100,000).

Under an assumption of lower regional growth (6.2 million people and 2.4 million jobs instead of 6.6 million people and 2.7 million jobs in 1990) downtown jobs in San Francisco and Oakland still would increase. The growth in Oakland, as in the GRONORTH alternative, would exceed the growth in San Francisco, with a net gain of 29,000 jobs between 1970 and 1990 versus 20,000 for San Francisco, With slower overall regional growth ABAG projects a continuing southern tilt.

Regional Development Impacts of BART

Extensive studies of the regional development impact of BART currently are being conducted by MTC and the University of California, Berkeley, and definitive conclusions will not be reached for several years. Considerable agreement, however, exists among planners and researchers that construction of BART has helped give impetus to further centralization as it was intended to do, but it would be an overstatement to say that BART is responsible. Regional headquarters sites such as Los Angeles, Seattle, and Portland experienced office construction booms in the 1960's and early 1970's without any promise of rapid transit service. Downtown San Francisco's prestige might have attracted nearly the same amount of investment without BART, although some buildings located near BART stations would have been on other sites.

Patronage projections indicate that a Livermore Valley BART extension providing the best service to Oakland and San Francisco would attract the most riders. As well-paid office workers must travel further to find new single family homes in homogeneous communities, their automobile commute becomes more onerous and costly (or even impossible if there is a prolonged energy shortage), and they readily can be attracted to high quality transit.

Surveys of land values and rents indicate that people are willing to pay a premium to live near a BART line. However, the characteristics of the existing land and the improvements compiled for the MTC/UC Berkeley BART residential land use impact study have been shown to explain more than 80 percent of the variance in property values, if accessibility factors are excluded. Consequently, predictions of BART impacts on outlying residential areas cannot be made with certainty. Areas that traditionally have attracted developers will be enhanced by BART, particularly if large acreages of undeveloped land still exist where new, BART-oriented development could occur.

BART and Subregional Office Development

If a larger share of regional office development could be directed to smaller centers in the region, total travel would be reduced. Retailing already is highly decentralized as are most services provided directly to consumers. So far, the Bay Area exhibits little tendency to form subregional office clusters such as those found in Westwood and Pasadena. When offices are built outside the regional core, as in Palo Alto or San Jose, the employees tend to live closer to their work places in a scattered pattern that is not well adapted to transit service. To be competitive under current conditions, outlying offices must be planned for full reliance on automobile travel. Once parking space is provided, the employment density is too low for efficient transit service, and the ease of driving and parking prevents transit from attracting a significant share of trips. Even if outlying offices could generate BART patronage, it is difficult to envision a change in the employment locations of Valley residents of sufficient magnitude to have a major effect on BART corridor patronage. For example, if 1990 employment in downtown Walnut Creek were to increase from the anticipated level (22,000) to the maximum that reasonably could occur (35,000), a BART extension via Walnut Creek still would carry only 60 percent of the riders who would use a Dublin Canyon route.

If regional policy were to discourage further intensification of development in the metropolitan core cities, BART should not have been built and should not be extended. It cannot help but favor additional development when high densities already exist. BART will cause relocation to sites near stations of some of the office development that would have occurred in outlying areas in any event, but it is unlikely to attract a significant amount of potential development from downtown Oakland and San Francisco to outlying BART-served locations. A decision to extend BART to Livermore and Pleasanton will not substantially alter the prevailing centralized regional office employment pattern.

CORRIDOR ALTERNATIVES

Five corridor alternatives for BART service to the Valley were studied: Niles Canyon/Mission Pass connecting to the Fremont or Union City BART Station, San Ramon Valley connecting to the Walnut Creek, Lafayette, or Pleasant Hill BART Station, and Dublin Canyon or Crow Canyon connecting to Hayward or the Bay Fair BART Station.

If present commute patterns are to be served most efficiently, Dublin Canyon is the obvious choice to provide service to the Valley. Oakland or San Francisco will be the destinations of 63 to 75 percent of BART Valley commuters, and Dublin Canyon is 15 minutes faster than the San Ramon Valley corridor, 7 minutes faster than the Niles Canyon/Mission Pass corridor, and 7 minutes faster than the Crow Canyon corridor to Oakland City Center. By minimizing commute time, selection of the Dublin corridor favors continued expansion of employment in downtown San Francisco and Oakland. Conversely, if expansion in the metropolitan core is anticipated whether or not BART is extended, the Dublin corridor will minimize total travel and total automobile travel. The Dublin corridor also would offer the 63,000 residents of Castro Valley (1990) improved BART service, but most of the potential patrons would use the Bay Fair Station if the Dublin corridor line were not built. However, additional parking would have to be provided at Bay Fair Station to meet demand and serious traffic congestion in the station area probably would occur. Assuming the Valley extension joins the existing line at Bay Fair, little additional development could be expected to result in the station vicinity. Although the Bay Fair regional shopping center adjoins the station and there is a good freeway accessibility, the area has little vacant land and lacks a positive image that would stimulate office construction.

VALLEY PLANNING ISSUES

Concern about the effect of additional development on air quality is the leading environmental issue because pollution has long been more severe than in most other parts of the Bay Area. Combined with this is the widespread wish to reduce growth rates found in most California communities on the fringes of major metropolitan areas. These feelings conflict with the desire for BART service, and many Valley residents interviewed would reject BART if they believe it will cause growth. This chapter looks at the probable ranges of growth and BART's potential for influencing the form of urban development and the amount of vehicle travel. The conclusion is that BART could bring moderate, but significant reductions in the amount of land urbanized and in the use of automobiles.

NATURAL SETTING AND ENVIRONMENTAL ISSUES

Topography

The Livermore-Amador Valley, an 81 square mile basin 21 miles southeast of Oakland, is an old lake bed with under one half of one percent slope in some places. Urbanization has caused little adverse environmental impact on the landform because the abundance of flat and gently rolling land has spared steeper slopes from development except in a few instances. However poor natural drainage and periodic flooding have constrained development in northwest Pleasanton.

The foothills to the north, east, and south are of moderate slope, especially in those sections adjacent to the Valley floor. This fact presents an important environmental planning issue. If the slopes were much steeper, development would be unthinkable; if they were much flatter, development would be inevitable. As they are of moderate slope, from 15 to 25 percent, the hazards of development need to be weighed very carefully in relation to potential geologic hazards and soil erosion. Heavy grading and typical tract homes on pads would mar the landscape.

In the context of BART route planning, it is important to determine to what extent the vulnerable slopes would be indirectly impacted by a BART extension and what mitigating measures could be used.

Geology

Four basic geologic factors must be considered in determining the best route for BART. Slope stability and faults are geologic hazards that affect public safety, while expansive soils and locally high water tables are geologic problems that can affect construction costs.

Faults — Because the whole Valley and the corridors would be subject to severe groundshaking in the event of an earthquake occurring along the major active faults in the Bay Area (such as the San Andreas or Hayward faults), this factor was not considered in comparing corridors and alternate routes. The Hayward Fault, which traverses the west end of Dublin Canyon, caused major earthquakes in 1836 and 1868.

Within the Livermore-Pleasanton area there are two fault zones that are known to be active and several others that must be considered potentially active, although the amount of activity is unknown. The Calaveras Fault, which runs along the west edge of the Valley, is a major tectonic structure that is known to be active and capable of producing a maximum credible earthquake magnitude 7½ (Richter Scale). The Pleasanton Fault zone, east of the Calaveras Fault, and sub-parallel to it, consists of several branches that first were located as groundwater barriers. The Pleasanton Fault is believed to be undergoing tectonic creep currently.

Potentially active faults include the Parks Fault which trends in an east-west direction oblique to the other faults within the area. It is known only as a groundwater barrier with no surface expression reported. Its present activity is unknown but it does offset the Plio-Pleistocene alluvium. The Livermore Fault zone trends northwest just west of Livermore and is exposed in a landslide scarp on the east side of Oak Knoll. The remainder of the fault's several branches are known only as groundwater barriers. The Mocho Fault has been mapped just to the east of the Livermore Fault zone, but its existence has not been confirmed. Because there is no surface expression of the faults within the Valley, a more detailed study should be made prior to constructing a BART extension in order to determine their exact location.

The least hazardous design for a rail line crossing faults is to have the roadbed at grade and at a right angle to the fault trace. If subway construction is necessary at a fault crossing, special design considerations, such as increased subway width, should be considered. Fault crossings on elevated structures represent the greatest hazard of the three alternatives because of the possibility of collapse of the structure.

Slope Stability — The major problems of slope stability that could threaten a BART route are found in the gravel pit area east of Pleasanton. Detailed engineering studies should be conducted to determine the stability of the pit cut slopes adjacent to the line and to assess the behavior of the slopes under both static and earthquake loading conditions. Except for this area, slope stability is not a critical environmental issue in relation to route location. However, land stability does affect the appropriate pattern of urbanization for the Valley. The northeast and south foothills are of varied but generally moderate hazard according to U.S. Geologic Survey reports. Pleasanton Ridge, on the other hand, is ranked in the most severe category of slope instability.

Soils: Agricultural Capability

Prime agricultural soils are found on the Valley floor and on adjacent ridgetops and spurs, but production has been greatly diminished by urban encroachment. Outstanding vineyards in the foothills and adjacent sloping terrain in the southeast corner of the Valley enjoy unique soil conditions and cannot relocate to other parts of the Valley if they are displaced by urban development.

Hydrology

The most important perennial streams in the Valley are the Arroyo del Valle and the Arroyo Mocho. Minor streams of interest are Devaney Canyon with beautiful, but small headwaters, Dublin Creek, Doolan Creek, and in the northeast, the Arroyo Las Positas. For the most part, the lower reaches of the major drainages have lost their natural value through channelization for flood control purposes. However, the middle and upper reaches of most of these streams are still important recreational, wildlife, and scenic resources, which will be lost unless upstream residential development is controlled. Urban development on the tops and spurs of foothills poses two important hydrologic issues. The creation of substantial impervious surface can raise flood peaks. If such development is sewered, water flows into stream channels, thereby accentuating flooding. If the areas remain unsewered and drainage is allowed to flow overland, hilltop development can lead to erosion, gullying, and landslides.

Beneath the Valley is an important natural groundwater reservoir. At present, the lower portions of the aquifer contain high quality water, but the Las Positas area north of Livermore suffers from high mineral content in the groundwater. Expansion of irrigation or urbanization of this area should be evaluated carefully to determine the potential effects on the quality of the groundwater.

Climate

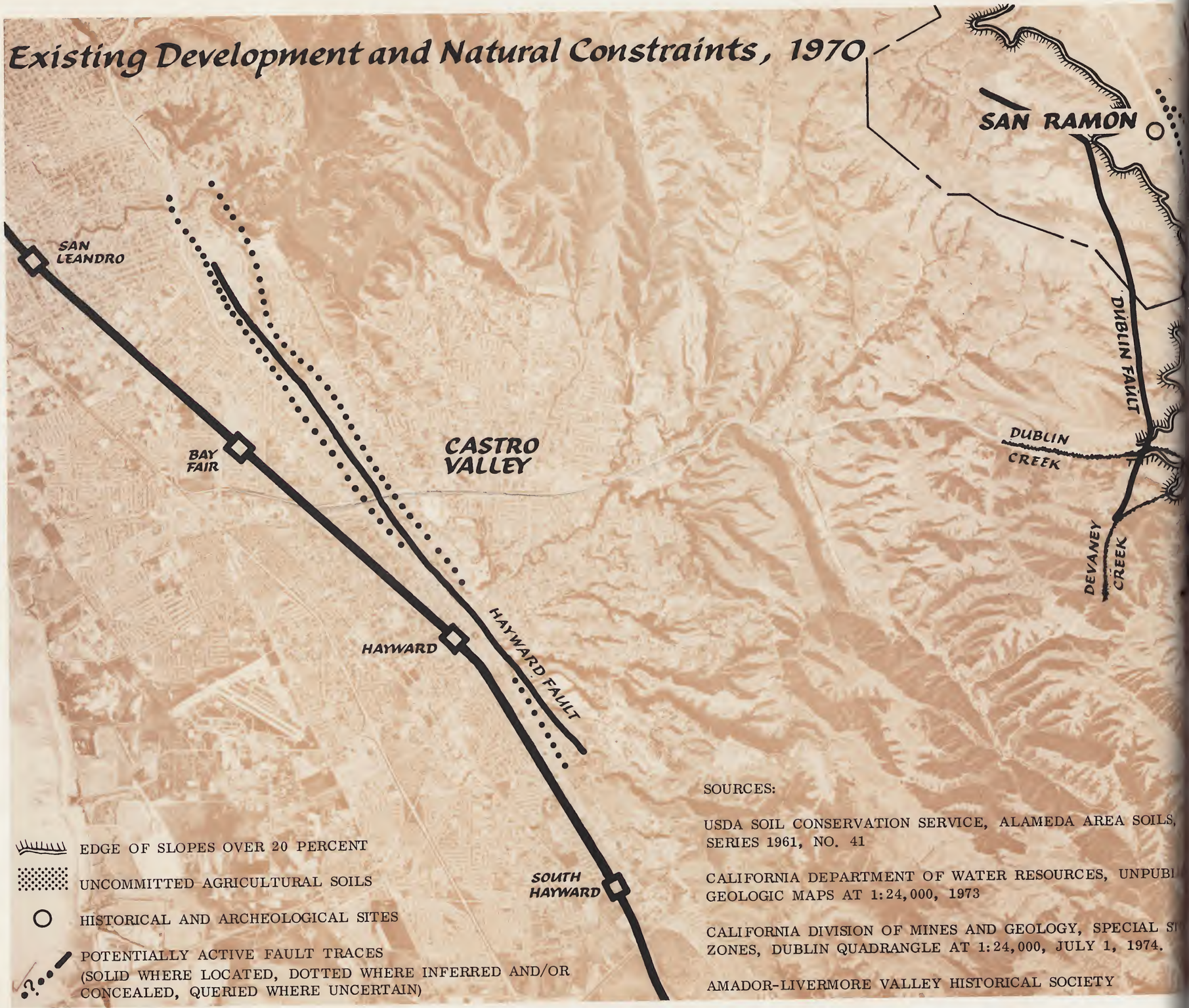
Warm, dry summers and mild, moist winters characterize the climate of the Valley. Of particular importance for land use and transportation planning is the air pollution problem. From June to October, inversion layers over the Valley and the Bay Area trap air pollutants, particularly hydrocarbons and nitrogen oxides resulting in severe photochemical oxidant (smog). Air pollution is more severe than in other areas in the East Bay, and recent records do not show air quality to be improving. Over the past 4 years, federal and State standards were exceeded from 40 to 188 days per year with much of the variation due to weather conditions.

The Valley tends to be cooler in the winter and warmer in the summer than areas near the Bay. Consequently, the use of energy for air conditioning in the summer probably equals or exceeds energy consumption for winter heating.

Vegetation

The indigenous vegetation is quite similar to the rest of the San Francisco Bay area, with extensive annual grasses and with oaks and bays in the major draws and on north and east slopes. In a number of instances, outstanding sycamores can be seen where streams emerge from the foothills onto the Valley floor. Much of what is seen today is the product of grazing, agriculture, and wildland fires.

Existing Development and Natural Constraints, 1970



EDGE OF SLOPES OVER 20 PERCENT

UNCOMMITTED AGRICULTURAL SOILS

HISTORICAL AND ARCHEOLOGICAL SITES

POTENTIALLY ACTIVE FAULT TRACES
(SOLID WHERE LOCATED, DOTTED WHERE INFERRED AND/OR CONCEALED, QUERIED WHERE UNCERTAIN)

SOURCES:

USDA SOIL CONSERVATION SERVICE, ALAMEDA AREA SOILS, SERIES 1961, NO. 41

CALIFORNIA DEPARTMENT OF WATER RESOURCES, UNPUBL GEOLOGIC MAPS AT 1:24,000, 1973

CALIFORNIA DIVISION OF MINES AND GEOLOGY, SPECIAL S ZONES, DUBLIN QUADRANGLE AT 1:24,000, JULY 1, 1974.

AMADOR-LIVERMORE VALLEY HISTORICAL SOCIETY

SAN RAMON

DUBLIN FAULT

DUBLIN CREEK

DEVANEY CREEK

CONTRA COSTA COUNTY

ALAMEDA COUNTY

TASSAJARA CREEK

ALAMO CREEK

PLEASANTON FAULT

DUBLIN

DOOLAN CANYON

COLLIER CANYON

TESLA FAULT

CAYETANO CREEK

CARNEGIE FAULT

ARROYO LAS POSITAS

MOCHO FAULT

ARROYO SECO

ARROYO MOCHO

LIVERMORE

PLEASANTON

ARROYO DEL VALLE

LIVERMORE FAULT

ARROYO DE LA LAGUNA

PLEASANTON RIDGE

ION SERVICE, ALAMEDA AREA SOILS,

ENT OF WATER RESOURCES, UNPUBLISH
24,000, 1973

OF MINES AND GEOLOGY, SPECIAL STUDI
ANGLE AT 1:24,000, JULY 1, 1974.

VALLEY HISTORICAL SOCIETY

The six natural plant communities found in the Valley are riparian woodland, oak woodland, broadleaf evergreen forest, chaparral, grassland, and freshwater marsh. Local topography, microclimate, natural drainage patterns, soils, and land use have influenced each ecological community's growth and development. The communities also have an impact on the natural environment by their effects on slope stability, aquifer recharge, fire hazard, and the microclimate. In addition, each ecological community provides suitable habitat for a number of animal species. For this reason, preservation of specific species has to be viewed as preservation of ecosystems. However, ecological preservation is not a major planning constraint because no rare and endangered species have been noted in the Valley or in Dublin Canyon.

HUMAN SETTING AND SOCIO-ECONOMIC ISSUES

The economy of the Livermore-Amador-San Ramon Valley was based solely on agricultural and gravel extraction prior to World War II. Camp Parks, the Lawrence Radiation Laboratory, Sandia Corporation, and the General Electric Vallecitos Laboratory brought employment that caused a fourfold increase in Valley population between 1940 and 1960. Since 1960, an influx of commuters seeking a desirable living environment in Livermore, Pleasanton, Dublin, and San Ramon, combined with modest increases in local industrial employment, has increased Valley population from 35,000 to 100,000 in 1972. As they see the Valley change before their eyes, many residents have become concerned about the rate and magnitude of growth, and its impact on their way of life. This concern was most forcefully expressed in the SAVE initiative, passed in both Livermore and Pleasanton in April 1972, which banned issuance of building permits when sewage treatment capacity, water supply, or school classroom space were inadequate. Thus, the potential benefits of BART service must be evaluated in conjunction with attitudes toward the kinds of change in the Valley's development pattern that BART will encourage.

Valley Population Growth

Perhaps the issue of greatest concern to Valley residents is the rate and amount of population growth. For BART extension planning, it is necessary to determine what effects transit will have on growth. Without growth constraints, an increase in accessibility that BART would provide might accelerate population growth. A 1974 report prepared by MTC concludes that a BART extension could lead to a population increase of 20,000, while each additional freeway lane also could induce approximately 20,000 additional persons to live in the Valley. These conclusions assume that population will level off when a certain level of freeway congestion is reached (service level D), an assumption that is not supported by experience elsewhere.

If growth constraints were in force, a given Valley population would require less urban land and would generate fewer vehicle miles of travel and less traffic congestion with BART. New population moving into the Valley will include a larger proportion of commuters than the present population. If BART service were assured, the population would include a larger percentage of potential BART riders than the present commuting population. Without effective control of location and density of new housing, BART could result in a loss of environmental quality because the larger population attracted by BART might consume more of the Valley's air and land resources and might generate more vehicle travel than the smaller population that would have existed without BART.

Benefits and Disbenefits of Growth

Transit aside, a larger Valley population would enjoy better shopping opportunities and more public services, and would have a stronger political voice. A regional shopping center with two or more full line department stores will be feasible when trade area population reaches 150,000. The Valley now has over 2,000 junior college students, many of whom will attend school at the new Livermore campus of the South County Junior College District. A 150 to 170 bed unit of a single large hospital to serve the entire Valley now is in the planning stage. To have an Alameda County supervisorial district representing the Valley alone would require about 250,000 people, while a congressional district must have 400,000.

The measurable disbenefits of growth mainly are increased air pollution and traffic congestion, and possibly higher cost of public services. Air quality levels may dictate a maximum population growth rate for the Valley based on emissions control policies.

Although a recent study for the City of Pleasanton concluded that service to each additional housing unit cost the City and the school districts more than they received at present tax rates, it does not necessarily follow that growth will be costly to the Valley. Expenditures per capita in California cities can be expected to be about five percent higher for cities of 150,000 than for cities of 50,000. Increases in com-

mercial and industrial valuation will more than offset the decrease in total assessed value of the remaining vacant land as population grows, and may even balance residential development deficits. BART could increase land values by stimulating development, or if growth limitations were in force, by increasing competition for the available housing supply and thus raising residential values.

Loss of views of open or agricultural land may be seen by many as an important disbenefit.

The smaller the population, the greater the share of daily personal contacts will be with friends and acquaintances. Growth reduces the probability that an individual will know a member of his city council, his school board, or other governing bodies. The intimate contacts believed by many anthropologists and sociologists to be essential for mental health and happiness are not likely to diminish with growth in the Valley. Only a truly rural society with its high degree of interdependence among families perpetuates intimate contacts. This way of life vanished long ago in the Valley. Stress as a result of the pace of life, noise, congestion, and information overload increases with population size, but the regional setting may be as important as the local setting.

A larger population creates more opportunities for satisfaction of specialized interests — from chamber music to bocci ball. It also provides the anonymity and the tolerance sought by eccentrics of all kinds, some of whom may make important contributions to the culture of an area.

The Valley's rapid growth during the past decade already has robbed downtown Livermore and downtown Pleasanton of primacy by making construction of a regional shopping center inevitable. In all but the largest California cities, central business districts have lost their leadership in retailing except where urban area growth has been slow. Growth does not mean that the historic downtowns necessarily will suffer an absolute sales decline, or that they cannot thrive on office development.

Relation Between Local Growth Policies and Regional Public Interest

If commuter housing demand remains strong as expected over the long term, restricted growth policies will raise housing prices, forcing some potential Valley residents to seek housing elsewhere. To the extent that out-commuters outbid Valley employees and force them to become in-commuters, total travel would increase. Dispersion of present concentrations of ethnic minorities and the poor would be retarded. On the other side of the ledger, open space preserved, particularly if it is accessible to the public, would be a regional benefit. A successful effort to slow growth and preserve open space in the Valley might lead to similar region-wide action that would restore the balance of development pressures, but still would tend to raise the cost of housing throughout the Bay Area.

Community Character

A BART extension could affect the pattern as well as the magnitude of urban growth. Around stations, BART could create opportunities for more compact development than otherwise would occur, thus allowing more open space to be preserved at any given population level. However, preservation would result only if there were strong local policies backed by stringent regulations limiting the rate and location of development. BART need not change the character of existing residential areas, but the opportunity BART provides to offer a different life style should not be overlooked. In the Valley Development Alternatives section that follows, the concept of a BART-oriented "new community" is presented to illustrate the potential for change that could occur with a BART extension.

Community development proposals that take maximum advantage of BART may involve departure from present community general plans and development policies. The extent to which BART would adversely affect presently developed residential neighborhoods was raised early in the study as an important issue. Related to this was the question of whether BART should be designed to reinforce the urban form envisioned by present general plans or whether BART would make changes in the plans desirable. Two separate aspects of this issue were examined. First was the type and intensity of residential development around stations, and second was the relation of BART to existing business districts. A key tradeoff was whether BART should be located to serve existing centers, or on outlying sites where vacant land is available for parking and new development could be oriented towards transit.

If BART patrons do not combine shopping with transit trips, the resulting congestion and the amount of land required for BART parking could cause stations near existing business centers to have a detrimental effect on both retailing and on the supply of moderately priced older housing. On the other hand, local buses

could serve BART and the business districts most easily if BART were located close to an existing center, and increased non-retail employment could stimulate BART patronage. Stations at outlying sites could compete successfully for office development because of potentially lower land costs and might even encourage development of moderate income housing within walking distance. In older, built up areas, BART might trigger private or publicly sponsored redevelopment, but in these instances the costs of displacement of people and businesses have to be weighed carefully against the potential benefits.

The Valley communities have a very small supply of old, low cost housing that should be conserved as the only housing opportunity for persons working at low-paying jobs in the Valley. BART stations serving existing business districts would deplete this supply either by acquisition for parking or by stimulating replacement by more expensive housing.

VALLEY DEVELOPMENT ALTERNATIVES

Given the assumption that Valley population will increase from 100,000 in 1972 to 178,000-227,000 in 1990 (see Framework chapter), what alternative forms might new development take? Since about half of the 1990 population already resides in the Valley, mainly in relatively new housing, the potential for change in present trends will depend on the location and density of the 26,000 to 42,000 housing units to be added. If new housing occupies the same land per unit as existing housing and if commercial and industrial uses expand proportionately, 39 to 45 percent of the Valley's buildable land under 20 percent slope will be urbanized, compared with 28 percent today. Although, tentative or final subdivision maps have been approved authorizing approximately 4,600 new units, 4,000 of which are single family homes, many may not be built if prices continue to outrun gains in personal income. If maintenance of reasonably compact communities, each with its own identity, is an objective, continuation of past market trends and present regulatory policies probably will achieve it. However, this pattern will sharply reduce the amount of open space in the Valley and is less suited to transit service than higher density development.

Table 1 describes existing land use and illustrates three Valley population and density alternatives that could be attained by 1990. In 1972, only 10 percent of the Valley's housing was high density. Most high density units are apartments; few townhouses or zero lot line units have been built. Unless regulatory policies intervene, the ratio of high density units will increase sharply by 1990. The example of Santa Clara County, a rapidly developing and admittedly larger and more diverse urban area, illustrates a typical trend as maturity is approached. In 1960, Santa Clara County had only 17 percent high density units, but during the 1960-70 decade 53 percent of the units built were high density, and by 1970 the high density share was 43 percent.

The reasons are rapidly rising housing costs, led by land costs, plus the adaptability of a greater proportion of the population to apartment living as fewer young unmarried people leave the community and the families who arrived early no longer have children living at home. If a sharply curtailed growth policy prevails in the Valley (178,000 population in 1990), the high density housing share might reach only 25 percent by 1990 as builders would seek to devote their limited ration of permits to single family homes because the market would be strong and profit margins are higher. Under the more liberal population assumption (227,000 in 1990), a high density share of 35 percent would be the likely expectation.

Using the same population projection and assuming a strong shift to higher density living, the non-single family detached share (multi-family, townhouse, zero lot line house, patio house, etc.) might reach 50 percent of the total stock. Under this assumption only 9,200 new single family detached homes would be built during the period, or 5,200 more than already are approved. About 78 percent of all new units built would be high density. Assuming an average density of 16 units per gross acre for the non-single family units, 1,360 more acres would be urbanized than with 178,000 people and 25 percent high density, and 2,840 less acres would be used than with 227,000 people and 35 percent high density units. With housing costs rising faster than personal income, such a strong shift to high density living is not an unrealistic possibility, but it would require some changes in public taste and a quality of design of high density housing that rarely is found today. One of the changes in public preferences that would make it possible would be a desire to live within walking distance of BART. The shift will come only if encouraged by local development policies, but may receive impetus from the energy shortage and air pollution control strategies. Support for such policies would be based on a desire to preserve open space and reduce dependence on the automobile, and probably would be coupled with a program for large scale permanent preservation of open space either through acquisition or by allowing developers to build only on a small portion of their sites.

TABLE 1. VALLEY DEVELOPMENT ALTERNATIVES

	1972	1990 Low-Sharply Curtailed Growth	1990 High-General Plan Growth Rate Limitation	1990 High-Strong Shift to Higher Density Housing		
				New Community	Valley Remainder	Valley Total
Population	102,000	178,000	227,000	35,000	192,000	227,000
Single family housing units	26,300	41,700	46,100	0	35,500	35,500
High density housing units	2,800	13,900	24,800	11,700	23,800	35,500
Single family acres	6,800	11,000	12,200	0	9,400	9,400
High density acres	200	900	2,200	600	1,600	2,200
Total residential acres	7,000	11,900	14,400	600	11,000	11,600
Retail acres	400	660	840	60	730	790
Office acres	50	90	110	20	90	110
Industry acres	1,200	1,800	2,300	100	2,200	2,300
Quarry acres	2,600	2,600	2,600	0	2,600	2,600
Orchard acres	840	30	30	0	30	30
Vineyard acres	1,860	2,270	2,060	0	2,270	2,270
Community facilities acres	3,000	4,000	4,400	700	3,700	4,400
Major street, rail, & utilities right of way	2,950	2,950	3,550	100	3,450	3,550
Vacant developable acres	42,300	35,900	31,900	3,920	30,630	34,550
Total developable acres	62,200	62,200	62,200	5,500[a]	56,700	62,200
Total urbanized acres[b]	17,200	24,000	28,200	1,580	23,770	25,350
(Per cent urbanized)	(27.7)	(38.6)	(45.3)	(28.7)	(41.9)	(40.8)

(a) Valley zones 36, 37, 38, 40, 41, 42, 43, and 44 (See Data Zones, Appendix A)
(b) Excludes orchard/vineyard

Source: Livingston and Blayney

ROLE OF BART IN VALLEY DEVELOPMENT ALTERNATIVES

BART's main influence on the development pattern of the Valley will be in attracting housing built for a commuter market to locations near the stations. With two-thirds of Valley jobs held by persons living in the Valley and only 5 percent of intra-Valley work trips projected on BART, there will be little influence on the choice of residential location for the 45 percent of all Valley employed persons who are not out-commuters.

Demand for BART-oriented Development

Only a portion of the available housing within walking distance of BART stations will be occupied by BART commuters. Assuming 43,700 out-commuters with 27 percent on BART, 12,000 commuters representing a total family population of 36,000 might want to live within walking distance. The Regional Transit Travel Projections Project estimates that 40 percent of the out-commuters travelling through Dublin Canyon would ride BART. (See Framework for Analysis chapter.) The proportion of commuter households that prefer and can afford single family houses is likely to be high. Better than 90 percent of present commuters live in single family houses. Land within walking distance of BART stations is expected to be priced too high for single family development. If, for example, only 25 percent of all BART commuters will accept high density housing, the total commuter household population wanting to live near stations would drop to 9,000 persons needing 3,000 housing units. Stations on the selected BART line could accommodate at least that much housing.

If all new Valley residents who are out-commuters wanted to live within walking distance of BART, there would be a demand for 23,400 housing units near stations. Since only 27 percent of the out-commuters are projected to be BART riders, the demand would drop to 6,300 nearby units, about 50 percent over the 4,400 unit capacity range of the area within walking distance of four Valley BART stations. Of course, not all housing near BART stations will be occupied by BART riders. By 1990, 11,000 to 22,000 high density units are expected to be built in the Valley without any major shift to high density. Since rental units would benefit from locations attractive to BART commuters even though many tenants would not use BART, the areas within walking distance of the stations would be fully developed. Thus, under a projection of probable trends, BART's major influence on urban form would be to cause about one-third of the new high density housing to cluster near stations.

While there is no evidence to show that BART would cause a shift in housing types, a strong shift to higher density probably could not be accomplished without BART. An important element in attracting a larger share of the new population to high density housing would be a desire for reduction of dependence on the car, whether for reasons of convenience, cost, or fuel shortage.

If 78 percent of the residents added by 1990 live in high density housing (50 percent of all residents) and 59 percent of new employed persons commute outside the Valley (55 percent of all employed persons), it seems reasonable to assume that 50 percent (instead of 27 percent) of these new commuters might ride BART if it were sufficiently convenient. This would create a market for housing for 29,200 persons within walking distance of BART, exceeding the capacity adjoining four Valley stations if all nearby residents were BART commuters.

BART-oriented New Community

This potentially unsatisfied demand for housing near BART would provide the opportunity to create a "new community" with maximum orientation to transit. With imaginative planning, 35,000 people could live in 11,700 housing units at 20 units per acre all within walking distance (assisted by moving sidewalks and horizontal elevators). A possible site would be north of I-580 at Livermore where the Alameda County Board of Supervisors recently gave preliminary approval to the Las Positas new town proposal. BART travel time would be 50 minutes from Oakland City Center. If a BART-oriented community were completed by 1990, the remainder of the Valley would be composed of 40 percent high density housing, only 5 percent above the share projected with no conscious effort to shift to high density, but there would be 2,800 acres (4 square miles) of additional open space and 4,400 fewer daily one-way commute trips on the highways, the equivalent of more than a freeway lane capacity.

Development of the new community could not start before high quality transit service is available if it is to attain the high density and transit orientation envisioned. If it were to be fully developed between

1980 and 1990 it would have to attract 10 percent of the population gain in Alameda and Contra Costa Counties (ABAG moderate growth projections) and half of the Valley growth during the period. These are high but not unattainable shares.

Retail and Office Development Impact

Retailing and offices will attract mainly intra-Valley trips, few of which BART would carry, and therefore will not concentrate near BART stations except to serve population in the immediate area. The exception would be that if a BART station enhances the identification and prestige of a commercial complex that is viable without BART, some additional office development may be attracted. In 1990, a maximum of about 9,000 jobs (17 percent of all Valley jobs) are likely to be located within walking distance of Valley BART stations on the selected line. If one-third of all Valley jobs are held by in-commuters and one-fifth of these employees ride BART, there would be 2,600 BART in-commuters in 1990. If five percent of intra-Valley work trips were via BART, there would be an additional 1,800 patrons. Because those who could walk to work from a BART station are more likely to use BART, it seems reasonable to project that 1,000 to 2,200 of those employed near stations would be BART riders (10-24 percent).

Impact on Automobile Use

Within the range of BART's potential to influence or make possible alternate patterns of Valley development, there is no urban form that will drastically reduce dependence on the automobile. The 227,000 residents in 1990 will generate on the order of 700,000 trips a day in the Valley (10 per housing unit)[a]. If BART were to carry 50,000 trips a day out of the Valley, exceeding line capacity with 6 minute headways and far surpassing projections, it would account for only 7 percent of all trips. Local bus systems in similar communities typically carry one to two percent of all trips. Even in a high density city such as San Francisco that has intensive transit service, only 20 percent of all trips are on the Muni. However, BART's ability to relieve peak period congestion and improve the quality of life for both users and non-users should not be underemphasized. With one-third of the out-commute work trips on BART, one to two less freeway lanes would be needed in each direction in 1990 than with no transit.

(a) 8th Progress Report on Trip Ends Generation Research Counts 1973, California Department of Transportation, District 4.

As an illustration of the theoretical maximum capability of BART to reduce automobile usage, assume that a new community and all of the land within walking distance of the four Valley stations with the highest residential development potential (not all on the selected route) were at population holding capacity in 1990, accommodating 54,000 persons. If these people made no automobile trips at all, and 10 percent of the trips generated by other Valley residents were diverted to transit, the total number of vehicle trips would be 32 percent less than with no transit.

ATTITUDES TOWARD BART AND DEVELOPMENT ALTERNATIVES

In February 1973, Gruen Gruen + Associates, Economic and Sociological Consultants, San Francisco, conducted a telephone survey of a random sample of 383 households in Livermore, Pleasanton, Dublin, Danville/Alamo, and Castro Valley. Tabulations and interpretations of responses to the 34 questions are contained in the survey report (see Appendix for abstract). Highlights pertinent to the study follow:

In Livermore and Pleasanton, about 90 percent of the respondents wanted a BART extension, but in Castro Valley the proportion favoring dropped to 57 percent and in Danville/Alamo to a bare majority of 51 percent.

Among husbands commuting to San Francisco, 47 percent would use a BART extension regularly, as would 35 percent of those employed in Oakland and 23 percent of Hayward/San Leandro workers.

Sixty percent of Valley residents who expressed a corridor preference favored Dublin Canyon.

Two-thirds of Livermore and Pleasanton respondents wanted the local BART station located outside of downtown. Only 15 percent thought their downtown purchases would increase if a BART station were there.

In the Valley, 31 percent of the respondents would be willing to pay more to live within walking distance of a station.

In Pleasanton, 42 percent of respondents had a moderate or strong desire to limit population growth, while in Livermore, only 27 percent expressed those views.

When asked whether they would favor a BART extension if it attracted an increase in apartment development, 49 percent of Valley residents expressing an opinion said that they would.

Two-thirds of Dublin and Pleasanton residents would prefer any population increase to be housed in single family subdivisions similar to those recently built rather than in garden apartments or townhouse clusters with large visible open spaces. In Livermore, only 49 percent felt that way.

Less than half of Valley residents were willing to accept any tax increase to preserve large areas for permanent open space.

A survey of 502 Livermore residents conducted later in the year by Corey, Canapary & Calanis as a basis for revision of the City's general plan found BART and better local transit as the second most frequently cited community need.

In summary, a BART extension has strong support in the Valley but only moderate support in the access corridors where respondents probably anticipate disruption without a significant gain in transportation service. Many Valley residents have an anti-growth viewpoint, and most are strongly desirous of maintaining current dominance of single family housing. If BART means more apartments, its desirability becomes a close question. The survey was not able to explore views toward BART if residents were to assume that the proportion of apartments in the Valley will increase greatly with or without BART and that the presence of BART would cause apartments to be concentrated near stations and would minimize vehicle miles of travel.

FRAMEWORK FOR ANALYSIS

EVALUATION PROCESS

Alternative BART routes and stations were evaluated in relation to a set of planning objectives drawn from the major issues identified at the beginning of the study. The objectives range from traditional transportation planning considerations (minimize construction and operating costs and maximize patronage) to broader social and economic concerns (preserve maximum open space and maximize development of existing centers in the Valley). Some of the objectives represent conflicting viewpoints that ultimately had to be resolved by the Board. BART's potential impact on growth and Valley development patterns being two obvious examples. The relationship between the issues and the planning objectives is shown in Table 2.

The extent to which a BART alternative would comply with an objective is measured according to one or more evaluation criteria. The most exact measure of compliance is dollar costs or savings. A second measure quantifies impacts that had been predicted for each alternate in terms of people, acres or trips. For some criteria, such as those relating to environmental quality and neighborhood disruption, rankings are relative and consequently less precise than the other two measures.

The evaluation procedure was designed to eliminate alternatives progressively. In the early phases of the study, only the major impacts were predicted for the alternatives in order to highlight the critical differences quickly. In later phases, additional criteria were measured and earlier measures refined as the study focused first on three Valley routes and two corridors and then on the BART vs. bus comparison. The distribution of the measures among the phases of the evaluation process is shown in Table 3.

TABLE 2. THE RELATIONSHIP BETWEEN ISSUES AND PLANNING OBJECTIVES

Issues	Objectives
Growth pressure caused by BART	Do not restrain Valley population growth Minimize Valley population growth Minimize inequities created by a BART extension Preserve maximum open space
Environmental impact of BART-related growth	Maximize environmental compatibility Preserve maximum open space
Community character	Do not restrain Valley population growth Minimize Valley population growth Maximize environmental compatibility Avoid change in presently developed residential neighborhoods Preserve maximum open space Maximize economic development of existing centers in the Valley
Residential development near stations	Maximize BART usage at a given population level Minimize total direct travel cost Preserve maximum open space Minimize local government costs
Relation of BART to existing centers	Maximize economic development of existing centers in the Valley
Corridor alternates - cost, service, impacts	Minimize BART construction and operating costs Maximize BART usage at a given population level Minimize total direct travel cost Maximize environmental compatibility Maximize compatibility with transit service in three corridors
Impact on point of connection to existing BART line	Maximize economic development at point of connection to existing BART line
Transit alternative (BART vs. bus)	(All objectives)
Compatibility with existing general plans	Maximize compatibility with existing general plans

Table 3: PHASES OF THE EVALUATION PROCESS

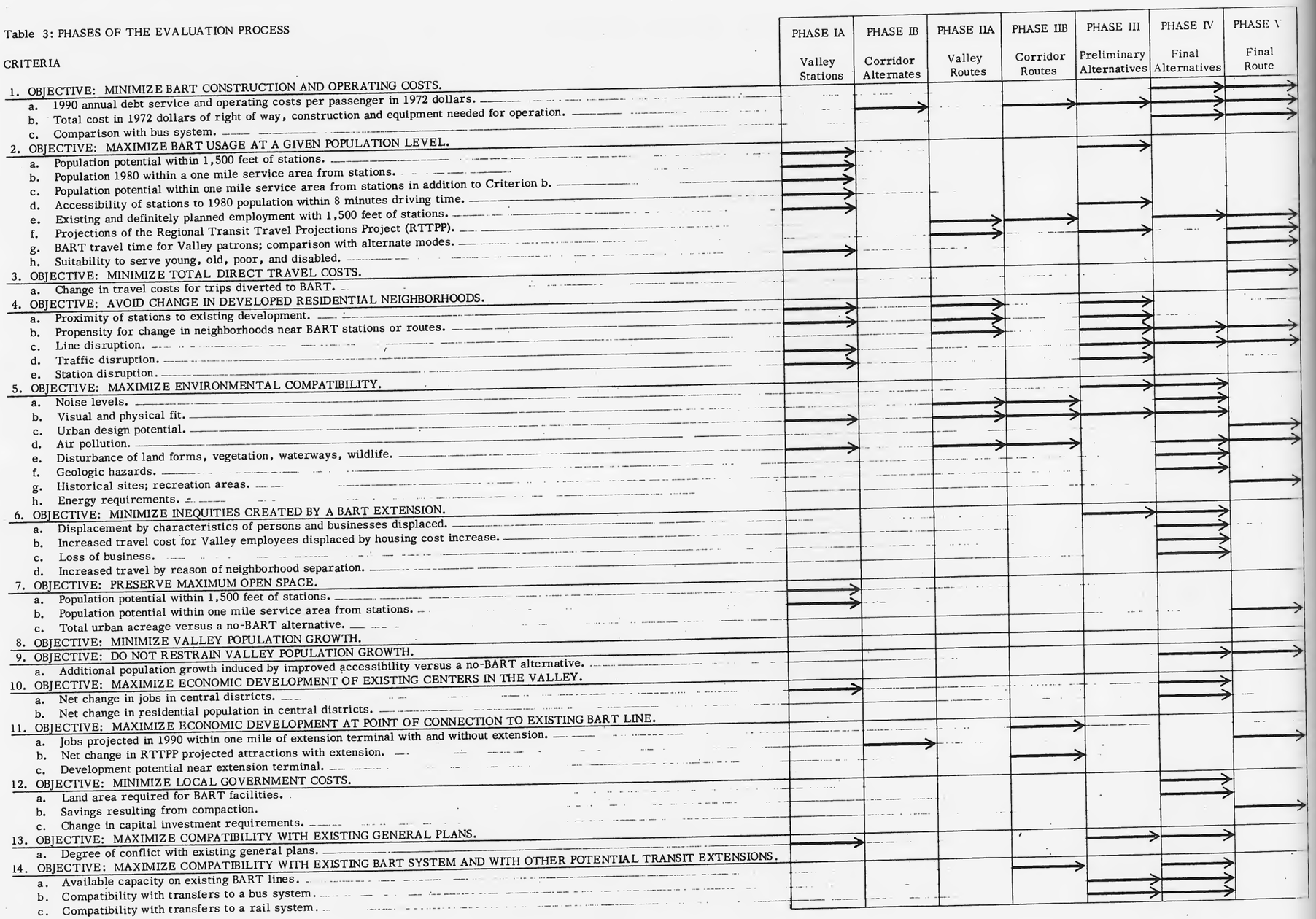


TABLE 4. LIVERMORE-AMADOR-SAN RAMON VALLEY POPULATION PROJECTIONS

	1970	1980	1990	2000	Holding Capacity
Full Development[a]	86,000	175,000	240,000	303,000	414,000
General Plans and Growth Rate Limitations[b]	86,000	169,000	227,000	292,000	359,000
Sharply Curtailed Growth[c]	86,000	145,000	178,000	210,000	252,000

(a) Full Development: Projects growth applying typical subdivision densities suited to topography to all potential residential land shown on general plans and other lands with less than 20 per cent average slope, assuming recent growth rates (Livermore, 760 housing units added per year; Pleasanton, 1,000; Dublin, 200; San Ramon, 500). This alternate assumes that the vineyards will not be retained and that, as in the Santa Clara Valley, general plan proposals will not prevail.

(b) General Plans and Growth Rate Limitation: Projects growth in accord with the current general plans for Livermore, Pleasanton, Dublin (Alameda County), and San Ramon (Contra Costa County), assuming 800 housing units added per year in Pleasanton and growth rates in other areas at the same levels as in the full development alternative.

(c) Sharply Curtailed Growth: Projects growth subject to limitations on both rate and total holding capacity of the Valley. Livermore: All open space shown on County Open Space Plan, rural and estates residential areas, other lands further than one half mile from existing development, and an additional 1,500 acres of flat land remain open; 500 housing units added per year. Pleasanton: All lands south and east of the present City boundary and 500 additional acres of flat land remain open; 500 housing units added per year. Dublin: Proposed low density areas in the hills remain open; 200 housing units added per year. San Ramon: Proposed low density areas in the hills and the area designated for medium density development along Dougherty Road remain open; 400 housing units added per year.

Source: Livingston and Blayney

POPULATION

Projections of population, economic activity, and land use provide the basic framework for analysis of a BART extension to the Valley. For this study, it is assumed that population growth will be governed by a combination of local development policies and State and federal environmental quality concerns rather than by unrestrained market demand. Population projections under three sets of policies, summarized in Table 4, show the Valley population (including San Ramon) increasing from 100,000 in 1970 to a range between 178,000 and 227,000 in 1990.

For planning areas outside the Valley, Metropolitan Transportation Commission (MTC)/Association of Bay Area Governments (ABAG) Series Two population projections produced for the Regional Transit Travel Projections Project (RTTPP) have been used. Because these projections reflect the broad framework provided by the ABAG Regional Plan 1970: 1990 and have not been subject to rigorous planning evaluation, they do not represent probable trends of future development everywhere. However, they do provide a consistent framework for analysis of BART impact in the corridors.

Total 1980 and 1990 population tributary to the selected BART route through the Dublin Canyon corridor to the Valley is shown in Table 3. The Valley population total refers to all those living in the Livermore-Amador-San Ramon Valley under the general plans and growth rate limitation projection, while the corridor population counts all persons living within two and a half miles of a Castro Valley BART Station.

TABLE 5. TOTAL POPULATION TRIBUTARY TO A LIVERMORE-PLEASANTON BART EXTENSION (SELECTED ROUTE)

	1980	1990
Valley population[a]	169,000	227,000
(Alameda County portion only)	(143,000)	(185,000)
Corridor population[b]	46,300	52,400
Total	215,300	279,400

Source:
(a) Livingston and Blayney based on general plans and projected growth rate limitations
(b) MTC/ABAG: Series Two Projections

These projections will be affected by several fast-changing phenomena that cannot be predicted with confidence. Foremost in everyone's mind today is the energy crisis. With an energy shortage, more growth pressure might occur in communities served by rapid transit, but overall regional growth could be less than currently expected if the regional and national economies enter a depression and migration to major coastal metropolitan areas drops off significantly. Air pollution control strategies could limit growth in the Valley, particularly if federal Environmental Protection Agency regulations governing construction of parking facilities and major traffic generators ("indirect sources" of air pollution) curb construction in the Valley. Local attitudes toward development and the ability of communities to extend sewer service to new development likewise will have a significant impact on future population growth. The amount of federal aid for expansion of sewage treatment capacity will depend on environmental policy, revenue sharing policy, and national economic conditions. The constitutionality of local restrictions on growth rates currently is being tested in the federal courts. Because these issues will not be resolved soon, the projections used in this study should be regarded only as assumptions to be used to examine BART impacts, to compare alternative BART extensions, and to evaluate the express bus alternative.

EMPLOYMENT

The following 1990 local employment and commuting projections are used as the basis for travel analysis.

227,000	population, 1990
79,450	employed residents, 1990 (35 percent of population vs. 34 percent, 1970)
43,700	employed residents commuting out the the Valley, 1990 (55 percent vs. 48 percent in 1970)
17,750	local jobs held by in-commuters (33 percent; same as in 1970)
5,000	employees at the Livermore Radiation Laboratory (constant).

The employment composition forecast reflects a judgment of the mix of economic activities that is likely to be found in the Valley at the stages of economic maturity through which it will be passing. Local employment projections by industry group are in Table 6. For planning areas outside the Valley, MTC/ABAG Series Two employment projections were used for analysis of BART impact except in Walnut Creek.

Walnut Creek Employment Assumption

During the study, the question of how a policy favoring development of Walnut Creek as a strong regional subcenter would affect the feasibility of a BART line in the San Ramon corridor emerged as critical. With a BART extension through the San Ramon corridor to the Valley and two downtown BART stations, Walnut Creek's potential as a regional subcenter could be reinforced.

To test the implications of intensive development on BART patronage, an alternative high growth employment assumption was made for downtown Walnut Creek, assuming a BART extension to the Valley.

In 1970, 10,300 persons were employed in central Walnut Creek. The 1990 MTC/ABAG employment projection for the downtown area is 22,000, with most of the increase occurring in retail and office employment. This employment gain would occupy the equivalent of 10 high-rise office buildings larger than any now in Walnut Creek and two or three major department stores.

To test the impact of the maximum increase that reasonably could occur, the Walnut Creek Planning Department and the consultants jointly agreed to assume 35,000 downtown jobs in 1990 based on the capacity of the local street system. The 13,000 additional jobs would be distributed equally between retail trade and services and offices. If the offices were all in high-rise buildings within walking distance of BART stations, 13 additional structures of 100,000 square feet each (typically 10 stories) would be built.

The initial economic analysis of the impact of a BART extension connecting to Walnut Creek projected an increase of only 1,900 jobs within walking distance of a BART station (an eight percent increase in the projected downtown employment). The 35,000 job assumption represented a seven-fold increase in that projection and was not based on economic analysis.

The BART patronage impact of the assumption is described in the following section.

TABLE 6. EMPLOYMENT PROJECTIONS LIVERMORE-AMADOR-SAN RAMON VALLEY

	1970[a]		1980		1990	
Agriculture	1,600	7.0%	1,300	3.3%	1,000	1.9%
Construction	700	3.0	1,000	2.5	1,200	2.2
Manufacturing	1,900	8.3	5,500	13.8	7,700	14.4
Transportation, Communication, & Utilities	400	1.8	500	1.3	600	1.1
Trade	2,500	11.0	6,200	15.5	9,300	17.3
Finance, Insurance, and Real Estate	700	3.0	1,400	3.5	2,100	3.9
Services	5,000	22.0	9,600	24.0	13,800	26.0
Government[b]	4,400	19.3	8,700	21.8	12,000	22.4
Other	100	0.5	200	0.5	300	0.5
Lawrence Radiation Laboratory	5,500	24.1	5,500	13.8	5,500	10.3
Total	22,800	100.0%	39,900	100.0%	53,500	100.0%

(a) Alameda County portion of Valley employment from California Department of Human Resources Development; Contra Costa County portion of Valley employment from Keyser/Marston and Associates estimate.

(b) Excludes Radiation Laboratory.

Source: Keyser/Marston and Associates

REGIONAL TRANSIT TRAVEL PROJECTIONS PROJECT (RTTPP)

The Livermore-Pleasanton BART Extension Study relies on the Regional Transit Travel Projections Project (RTTPP) for projections of patronage. The purpose of RTTPP was to develop a simplified Bay Area regional transportation model to forecast future transit and highway usage under alternative growth and urban development assumptions for each of the BART extension studies. The project was a joint effort of BART, CALTRANS, and MTC, with the assistance of the consultant teams working on the individual extension studies. Task I of RTTPP, completed in January 1973, produced order of magnitude corridor estimates. These projections were intended to gauge the relative service provided by alternate corridors and were based on high and low estimates of the propensity for travelers to choose public transit. These initial projections were at a gross level using Bay Area Transportation Study (BATS) data, more recent MTC/ABAG employment forecasts, Department of Finance population projections (Alternate C-300), and population projections for the Valley supplied by the consultants. The entire Valley was treated as one zone with similar travel characteristics.

The preliminary patronage projections were designed to evaluate the Dublin, San Ramon, and Niles Canyon corridors. High and low 1980 work trip projections are presented in Table 7. The HITRANS projections assume commuters would be willing to spend more time riding on BART than driving or riding on a bus.

TABLE 7. PRELIMINARY CORRIDOR PATRONAGE PROJECTIONS (Average Daily Work Trips at Maximum Load Points)

	1980 LOTRANS	1980 HITRANS
Dublin Canyon Corridor	15,391	20,701
San Ramon Corridor		18,675
Niles Canyon Corridor		12,158

Source: Regional Transit Travel Projection Project, Task I

For the only comparable set of assumptions, Dublin Canyon work trips exceed Niles Canyon by 70 percent and San Ramon by 11 percent. However, RTTPP Task I does not show that total BART system patronage is sensitive to corridor selection, probably because the analysis zones are so large. The apparent assumption is that BART patrons who would not be well served by Niles Canyon corridor line would board BART at Bay Fair or Walnut Creek.

Transit accounts for about 13 percent of all work trips produced in the study area and about 5 percent of all trips attracted. The maximum share of intra-Valley work trips on transit is 5 or 6 percent. RTTPP Task I projections show one-third of the outbound commuters and one-fifth of the inbound commuters using BART.

RTTPP Task III Projections

Task III of RTTPP, completed in February 1974, produced more refined estimates of regional travel with five specific corridor and transportation system alternatives. Because these tests did not include uniform population and employment assumptions for the Valley, the forecasts were adjusted manually by the BART staff to permit comparisons of rail and bus alternatives. The results of the BART staff analysis of the RTTPP Task III patronage tests are presented in the following sections.

These forecasts of travel patterns and patronage were used in the refined impact analysis and revenue/cost evaluation of the selected BART route. However, to retain consistency with earlier evaluations and to take advantage of a finer zone structure, CALTRANS traffic projections were used in station area impact analysis.

Valley Travel Patterns

The patterns of 1990 travel forecast by the RTTPP model are consistent with the assumption made early in the study that the majority of employed Valley residents will continue to commute to work outside the Valley. Furthermore, close to 20 percent of the 1990 non-work trips also will be to destinations outside the Valley. Even with the variations in population and employment among the alternatives, travel behavior by Valley residents remained relatively stable. Table 8 shows the percentage distribution of Valley resident travel for work and non-work trips in each of the three corridors in relation to local trips. Over half of the trips are local with an average length of 2 to 3 miles. Trips outside the Valley, however, tend to be quite long, from 20 to 30 miles, and make the greatest contribution to total vehicle miles of travel.

According to the model, in-commuting in 1990 is projected to be almost the same as initially assumed — 17,150 local jobs held by in-commuters.

Corridor Comparisons

Total 1990 daily patronage on the selected Livermore-Pleasanton BART extension through Dublin Canyon is forecast to be 34,000, while 1990 patronage on a San

TABLE 8. PERCENTAGE DISTRIBUTION OF VALLEY RESIDENT TRAVEL, 1990[a]

	Work Trips	Non-Work Trips	Total Trips
Local (intra-Valley)	13.0%	58.0%	71.0%
Westbound (Dublin Canyon)	11.6	9.4	21.0
Northbound (San Ramon Valley)	1.2	2.8	4.0
Southbound (Niles Canyon/Mission Pass)	2.2	1.8	4.0
Total	28.0%	72.0%	100.0%

(a) Percentages remain relatively constant with all network alternatives tested.

Source: BART; Regional Transit Travel Projections Project, Task III

Ramon Corridor extension to the Valley is estimated at 22,000. The RTTPP Task III test of patronage on a San Ramon line incorporated the "high" employment assumption for Walnut Creek. The results demonstrate convincingly that far more drastic shifts in job concentrations and regional transportation policies would be required to change the Valley residents' travel patterns.

Without the high employment in Walnut Creek, patronage on a San Ramon BART extension might be almost 5,000 trips lower than forecast by the RTTPP Task III model. (If half of the 13,000 new employees assumed for the "high" employment level lived in the Valley and 35 percent rode BART, 4,100 additional work trips would be added to the BART line. When non-work trips are included averaging 20 percent of work trip volumes, the potential gain attributable to the "high" employment assumption rises to 4,970 trips per day.)

Selected Route Patronage Forecast

The Task III 1990 patronage forecast for the selected route shows 26,000 work trips, and 10,000 non-work trips transferring at Bay Fair Station. About 1,400 trips bound for Bay Fair originate in Castro Valley, while total 1990 daily travel through Dublin Canyon is estimated at 34,000. An additional 2,300 intra-Valley trips are forecast, two-thirds of which would be non-work trips. The distribution of travel by trip purpose for the selected Livermore-Pleasanton BART Extension is summarized in Table 9. The station volumes projected by the RTTPP Task III model will be presented in the Selected BART Route chapter.

BART vs. Bus Patronage Comparison

The RTTPP Task III patronage model compared the attractiveness of BART through Dublin Canyon to express buses operating in mixed traffic and on an exclusive right of way in the I-580 median. The 1990 bus system, described in detail in the Bus Alternative chapter, would offer a high level of transit service during the peak periods with buses from Livermore operating at one minute intervals, from Pleasanton at 2½ minute intervals, and from Dublin/San Ramon at 4½ minute intervals. The summary of the results, shown in Table 10, were adjusted by the BART staff to a common population and employment base for use in the BART vs. bus comparison. An additional 1,000 intra-Valley bus trips are forecast.

TABLE 9. LIVERMORE-PLEASANTON BART EXTENSION PATRONAGE FORECAST, 1990 (SELECTED ROUTE)

	Work Trips	Per Cent	Non-work Trips	Per Cent	Total Trips
Travel through Dublin Canyon	25,000	(74)	9,000	(26)	34,000
Intra-Valley travel	700	(40)	1,600	(60)	2,300
Total Valley patronage	25,700	(69)	10,600	(31)	36,300

Source: BART; Regional Transit Travel Projections Project, Task III

TABLE 10. BART/BUS DAILY PATRONAGE COMPARISON IN DUBLIN CANYON, 1990

	Total Trips	Valley Resident Trips	Work Trips
BART	34,000	31,000	25,000
Bus Alternative	21,000	20,000	18,000

Source: BART; Regional Transit Travel Projections Project, Task III

Highway (non-transit) travel through Dublin Canyon in 1990 is estimated at 107,000 person trips for the bus alternative and 103,000 with BART. Consequently, total Dublin Canyon travel excluding through traffic on I-580 — highway traffic originating east of Altamont Pass — is forecast at 127,000 with the bus alternative and 135,000 with BART. BART appears to be more effective in getting people out of their cars. However, BART also seems to increase total travel in the Dublin Canyon corridor so the decrease in non-transit trips is only half the difference between BART and bus patronage.

BART OPERATIONS POLICY

Three options are available for operating trains on extensions of the basic BART Daly City-Concord, Daly City-Richmond, Daly City-Fremont, and Richmond-Fremont lines.

Option 1 entails adding a Livermore-Daly City, Livermore-Richmond, or Livermore-Concord line to the basic system.

Option 2 involves splitting service on the basic system and merging the trains from the extension with those on the main line without increasing the number of trains on the main line.

Option 3 calls for shuttle service on the extension line to a transfer station on the main line.

Selection of the most appropriate option is dependent on the capacity of the basic system, service and schedule balancing, and policy decisions regarding acceptability of transfer and of splitting main line service. Capacity of the basic BART system is constrained by the Transbay Tube, the Oakland Wye, and the Daly City Station. Design of the BART system was based on the assumption that 90 second headways during peak period operation would be possible. However, operating experience indicates that headways shorter than 2 minutes are not practical with the existing turnback facilities at the terminal stations.

BART's Regional Operations Issues report (April, 1973) states that peak period headways eventually may be reduced from two minutes to 90 seconds, but "routing of additional service lines through these areas (Transbay Tube and Oakland Wye) is not practical."

Current BART projections indicate that the Fremont Line will have sufficient capacity to handle the additional patronage from a Livermore extension. Heavier loads on the Fremont-Daly City Line will result in trains with standees, while relatively light loads on the Fremont-Richmond Line will allow most passengers to be seated.

Ideally, an expanded system would not reduce the quality of service or increase the headways on the basic system. However, patronage on new segments may warrant turning back or splitting service at intermediate points, such as Daly City or Bay Fair. If BART is extended to the Valley from Bay Fair with a direct connection, some trains might be routed to Livermore, although this would reduce service to Fremont Line stations south of Bay Fair.

The issue of transfer versus direct service must be evaluated as a trade-off between operating alternatives and the marketing aspect of the total regional system and, in particular, the extension under consideration. In general, transfers are inconvenient, and transfer stations must be designed to minimize inconvenience to patrons.

Under Option 1, an additional train would be introduced on the main line north of Bay Fair Station and headways through the transbay tube would be reduced to 90 seconds. Alternatively, a third and fourth track could be built through the Oakland Wye as originally planned, thereby increasing the capacity of the basic BART system significantly. Additional trains could be routed from Richmond or Concord to Daly City and from Livermore to Richmond and/or Concord. With this option, the merger of the extension line with the main line would create train control problems, according to BART.

Under Option 2, service would be reduced on the outer legs of the basic system. For example, peak period headways on the Fremont Line south of Bay Fair would be increased from three to six minutes with one half of the trains routed to the Livermore Valley extension via Dublin Canyon. Thus, the average waiting time for a train south of Bay Fair would be increased to equal that on the Concord Line. The train control problems introduced by the merge would not be as severe as in Option 1 because main line headways north of Bay Fair could remain unchanged.

Option 3 would not provide a direct connection between the main line and the extension other than for service to the Hayward yard. All passengers from the extension would transfer at Bay Fair. An independent shuttle service would avoid any new train control problems on the basic system, and close scheduling and proper design of the transfer station could minimize passenger delay and inconvenience. As in Option 2, main line capacity would not be increased.

Because BART operations policy strongly favors Option 3 (transfer to the main line), this option was assumed in the design of the extension through Dublin Canyon. If BART operations policy should change in the future, Option 1 would be the most beneficial for transit patrons. Not only would this option eliminate transfers for most riders, but it would increase main line service. For this reason, it is important that the tie-in facilities at Bay Fair be designed to allow direct service in the future.

SELECTED BART ROUTE

The BART route selected by the Board of Control (see Summary inside back cover) extends from Bay Fair Station through Dublin Canyon in the median of the I-580 Freeway, turns south along I-680 and then east at Bernal Avenue. BART would be in a subway through downtown Pleasanton, rising before crossing Arroyo del Valle and following the railroad tracks to Livermore where it would parallel the consolidated Western Pacific and Southern Pacific right of way at grade through downtown, terminating east of the proposed extension of Mines Road. The five proposed stations are at Castro Valley, Dublin-Northwest Pleasanton, Pleasanton (south of Bernal Avenue), West Livermore, and East Livermore. More detailed descriptions of the route and the stations follow. The chapter concludes with an analysis of station and alignment alternatives studied and a summary of travel times, equipment specifications, track criteria, support facilities service schedules, rolling stock requirements, and capital and operating costs and revenues.

LINE DESCRIPTION

Bay Fair Connection

Several alternative connections to the Fremont Line at Bay Fair Station were studied, all approaching from the south. Because Western Pacific railroad tracks are immediately west of the Fremont Line, a Valley BART extension must adjoin the east side.

The recommended connection shown on the schematic site plan provides for minimum disruption of the BART Fremont Line during construction, is geared toward operation of the extension as a shuttle service to the main line, provides for a direct non-revenue service connection to the Hayward Yard, and is relatively inexpensive to construct. If BART operations policy changes, this alternative permits a direct revenue service connection to the main line. However, across the platform transfers are not possible with this design.

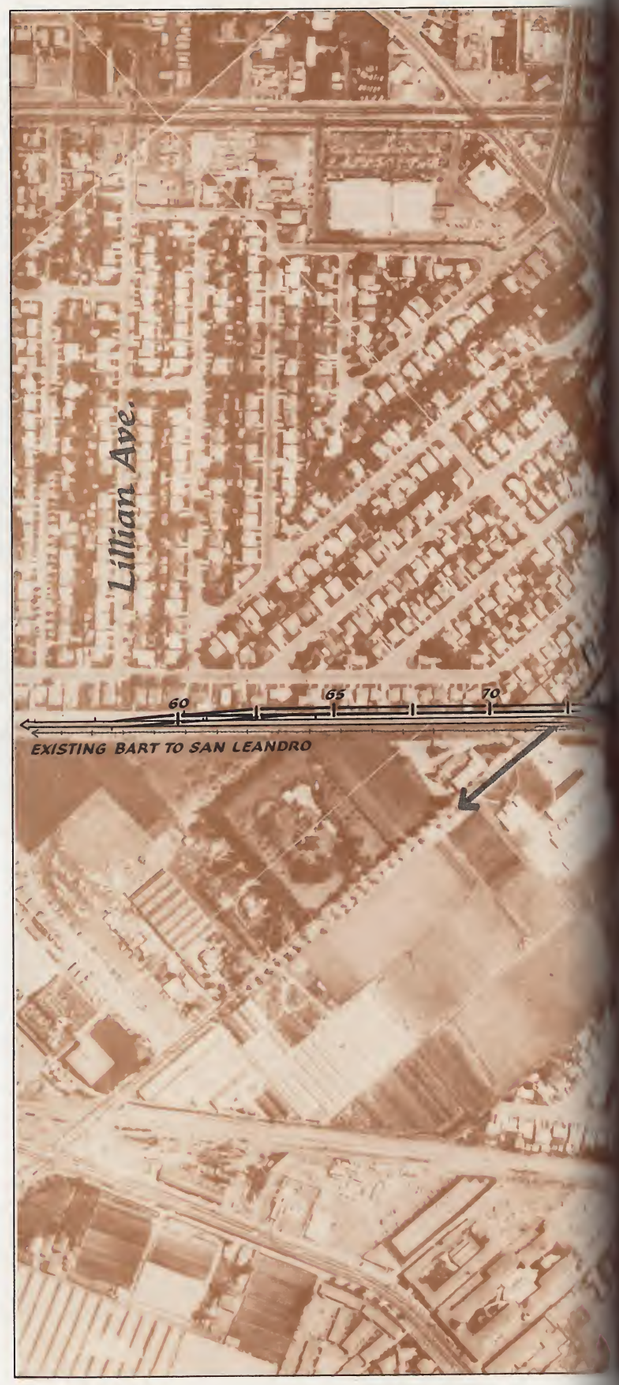
Construction would not require relocation of any existing BART track. A new central platform would be constructed east of the existing central platform and would be used by all Valley passengers. The transfer between the Valley extension and the Fremont Line would be at the mezzanine level, requiring passengers to descend and then go back up. Crossovers connecting the Livermore Line to the Fremont Line and 4,000 feet of track north of the new platform would provide maximum flexibility.

Trains from Livermore would approach on Track 4, cross over south of the new platform and enter the station on Track 3. After loading and unloading passengers, the train would reverse direction and return to Livermore via Track 3. Alternatively, a Livermore train could enter the station on Track 4, discharge and pick up passengers, reverse direction, cross over to Track 3, and return to Livermore. Livermore trains headed for the Hayward Yard would reverse on either Track 3 or 4 north of Halcyon Drive, cross over Track 2 of the Fremont Line and merge with the southbound Fremont Line (Track 1). Trains returning from the Hayward Yard would use the same crossover to Track 3, reverse direction, re-enter the Bay Fair Station, and continue on to Livermore on Track 3.

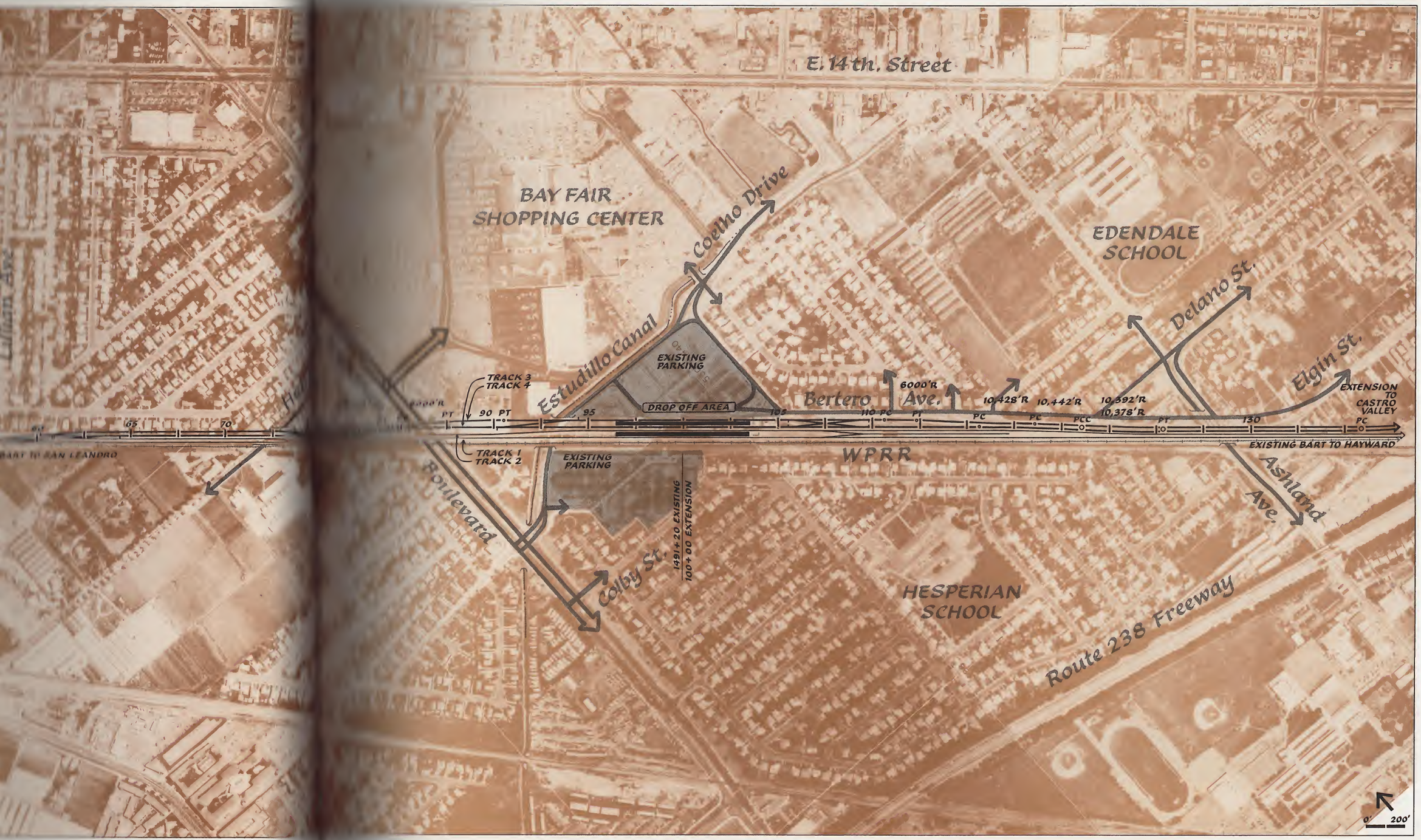
Track 4 north of the station, would be used for temporary train storage as well as storage of track maintenance and repair vehicles.

The position of the crossovers from Track 4 to 3 to 2 and from Track 1 to 2 to 3 will permit direct service to Oakland and either Richmond, Concord, or Daly City. Westbound trains from Livermore would approach from Track 4 and merge with northbound Track 2. Southbound trains to Livermore would switch from Track 1, across Track 2, to Track 3. Passengers would be picked up and discharged at the new platform. Direct service would require a crossover on the main line or construction of a grade separation, a drawback of this connection scheme.

The existing storage track, south of the station plus several horizontal and vertical curves, prevent locating a connection between Track 3, Track 2, and Track 1, south of the proposed double crossover. A crossover in that location would have allowed a connection to the Hayward Yard south of Bay Fair Station, eliminating the need for the three crossovers and the northern sections of Track 3 and 4 and permitting the crossover from the extension to the main line to be further south.

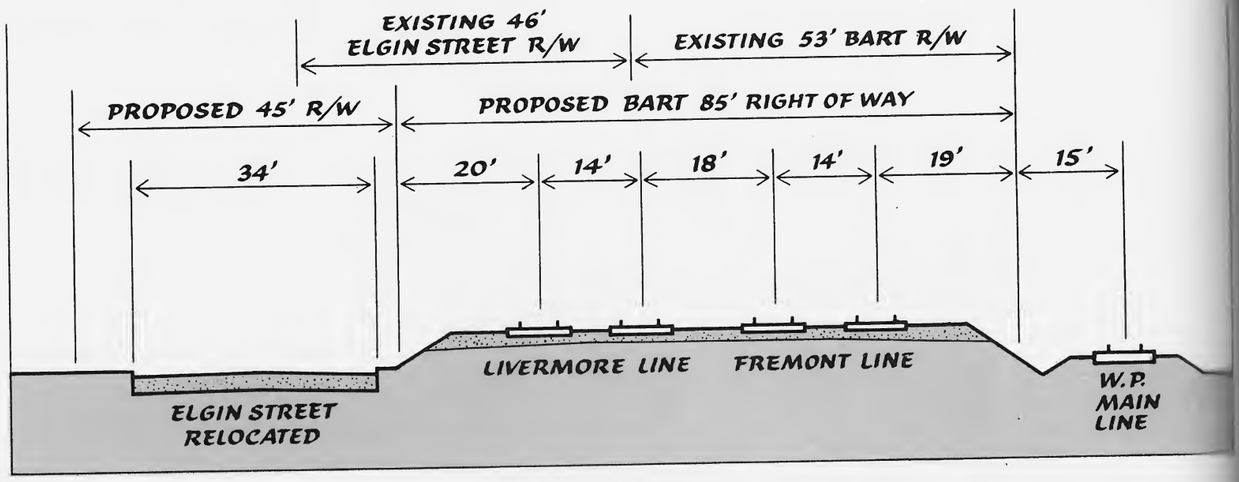

Lillian Ave.
60
65
70
EXISTING BART TO SAN LEANDRO

Bay Fair Station Schematic Site Plan

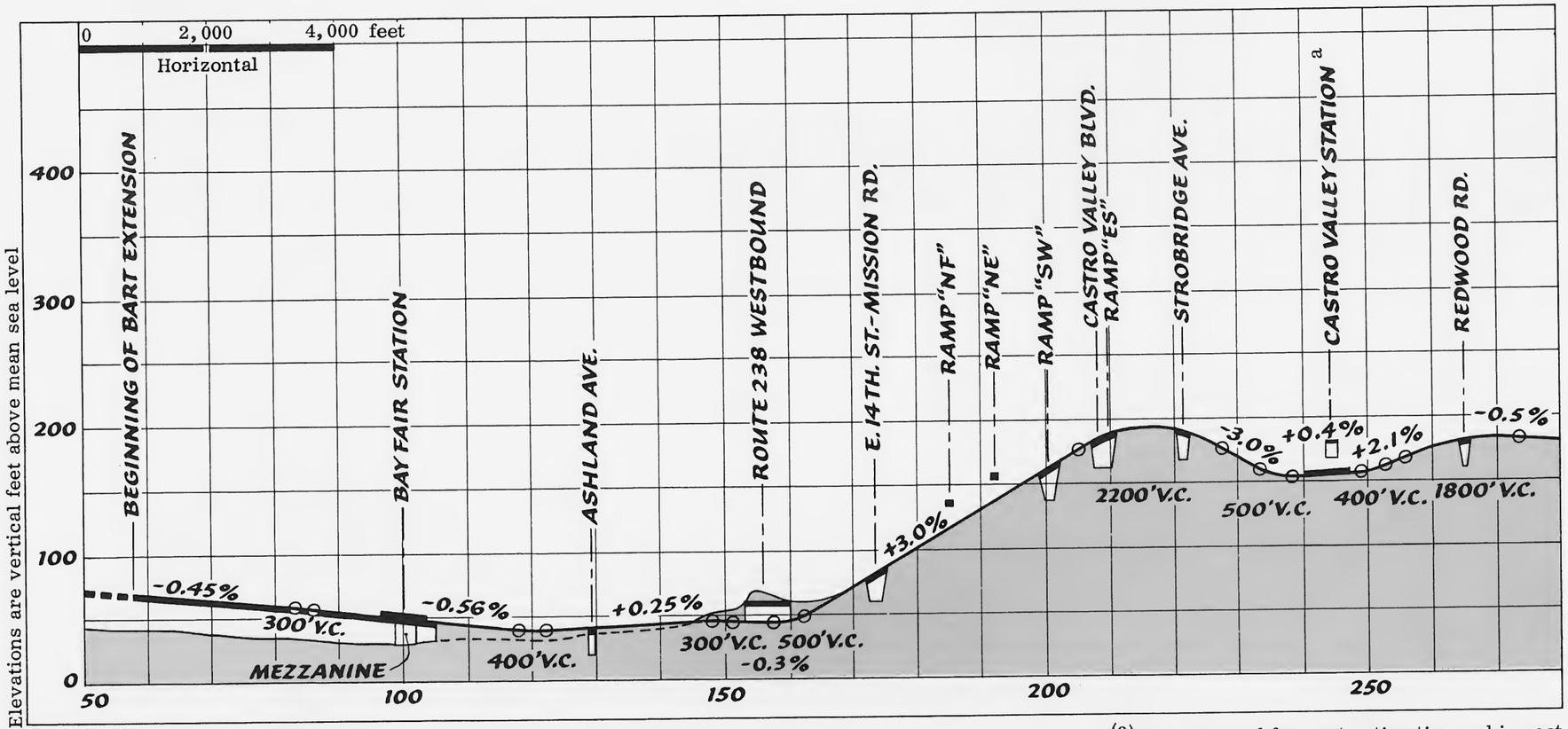


Bay Fair to Dublin

South of Bay Fair Station, the BART extension would be on aerial structure along the east side of the existing Fremont BART Line. After crossing over an existing BART substation, the line would continue south on embankment, gradually descending to grade at the Ashland Avenue undercrossing. East of Kent Avenue, BART would cross under the westbound lanes of the State Route 238 Freeway, and enter the freeway median. Once in the median, the line would climb at a 3 percent grade to the level of the freeway lanes. A steeper climb would slow down BART trains. The grade for each major line segment is indicated on the line profile drawings.

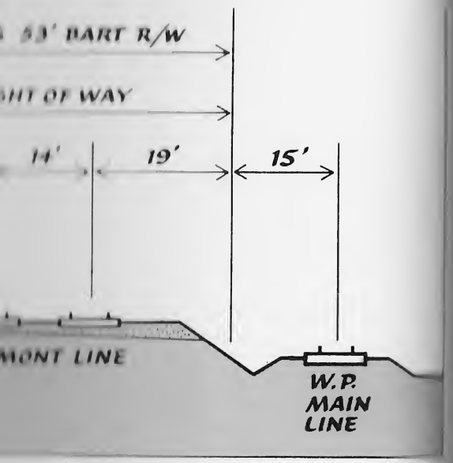


Elgin Street Section Near Ashland Avenue

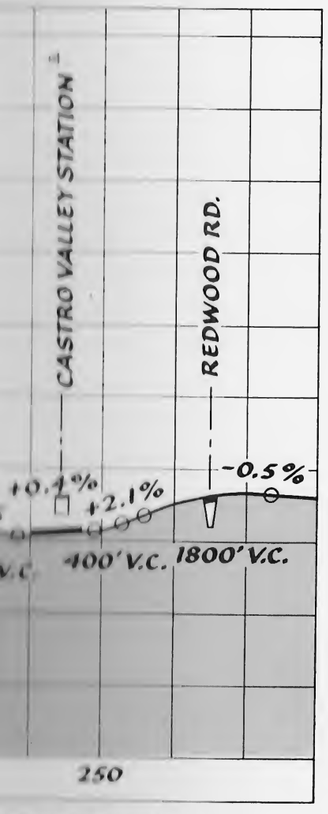


Bay Fair to Castro Valley Profile

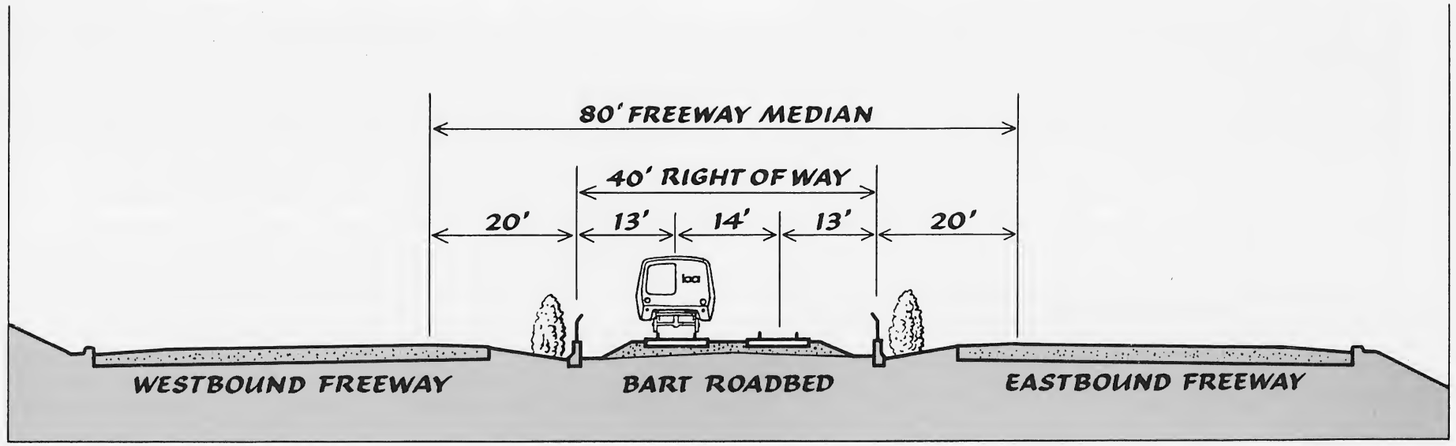
(a) Site assumed for cost estimating and impact analysis, further studies are recommended.



nd Avenue



or cost estimating and impact
er studies are recommended.



I-580 Freeway Median Section, Castro Valley to Dublin

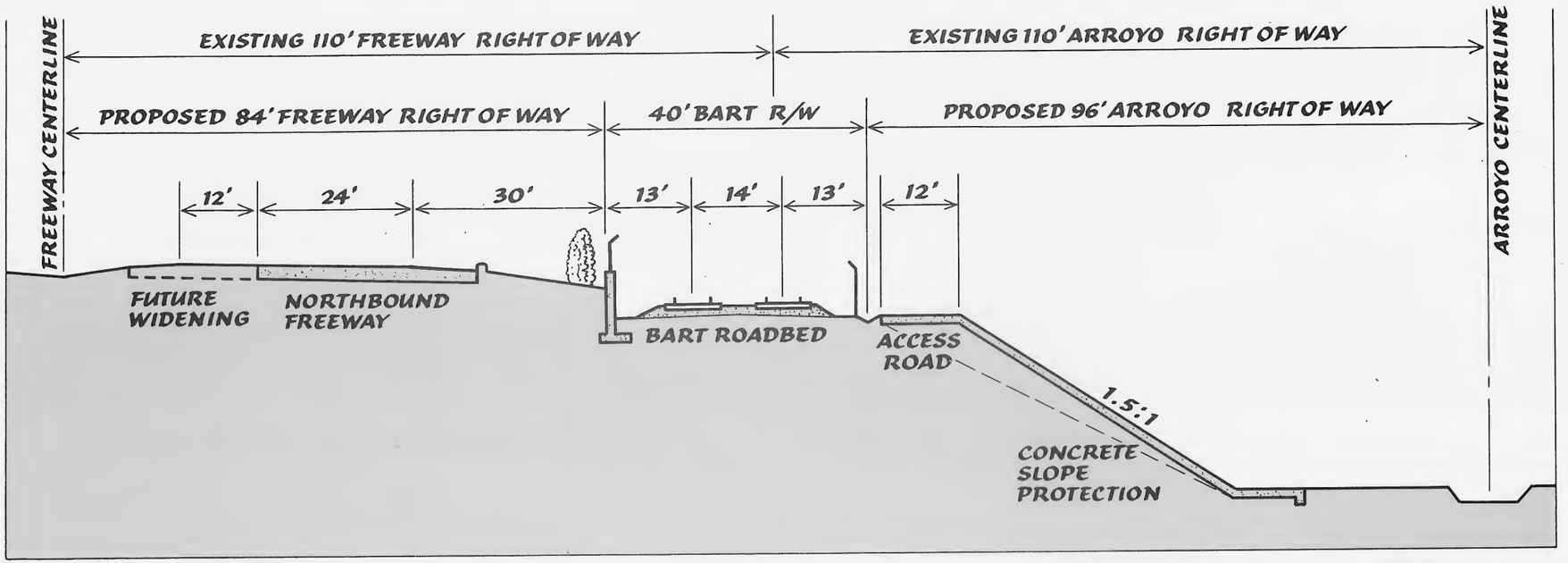
Thirty-two feet of additional right of way would be required for the BART extension line alongside the Fremont BART Line to provide for an 18 foot separation between the extension lines and the existing line and to allow 14 feet between the extension tracks. To accomplish this, Elgin Street would have to be relocated 32 feet east between Bay Fair Station and a point several hundred feet south of Ashland Avenue. From here on, the right of way for the extension line would be approximately 40 feet in width until BART reached the median of State Route 238.

BART would enter the freeway median through a 750 foot long double box structure under the westbound freeway lanes. East of the box structure, two 900 foot long retaining walls would line both sides as the BART line rose to meet freeway grade. (The schematic drawing for this entry is shown in the Bus Alternative chapter.) To allow for this structure, the eastbound freeway lanes would have to be relocated 30 feet south in order to widen the median. At some future date, probably after 1990, CALTRANS is planning to widen State Route 238 between East 14th Street and State Route 17 from the existing four lanes to eight lanes. At that time, the box structure would have to be lengthened 250 feet.

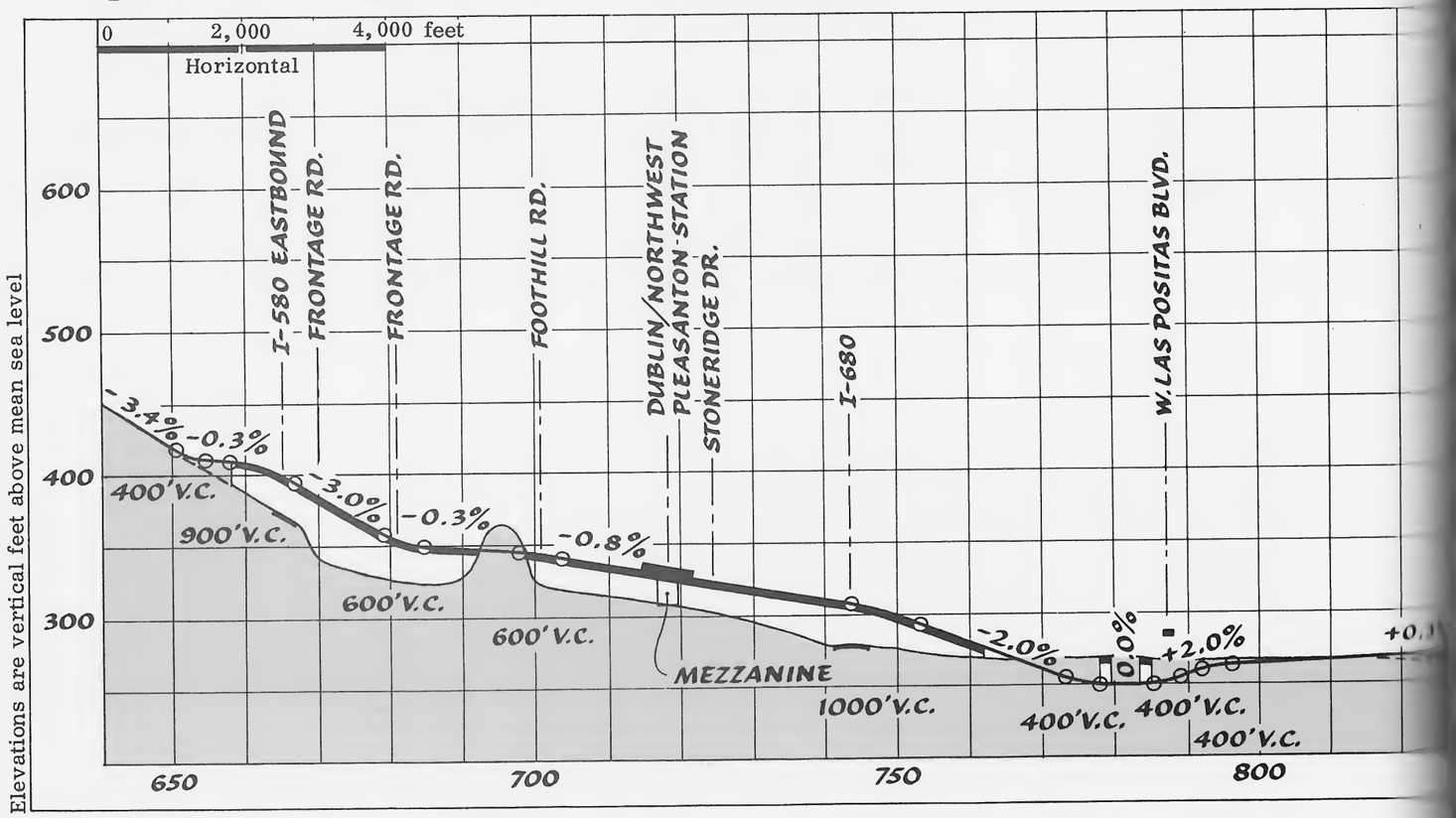
West of the East 14th Street overcrossing, BART would reach the same grade as the freeway and would continue in the freeway median through Dublin Canyon to the exit structure just west of Foothill Road. After passing East 14th Street, BART would climb at a 3 percent grade, pass through the State Route 238/Interstate 580 interchange, and descend on a 3 percent grade to the Castro Valley Station. The entire I-580 route is designed by CALTRANS to allow 80 mph operation with a horizontal curvature of 3,040 feet and a maximum 3.4 percent grade. Horizontal curvature which, along with grade, determines maximum BART speed is shown for all curves on the selected BART line map (see inside back cover).

Dublin to Pleasanton

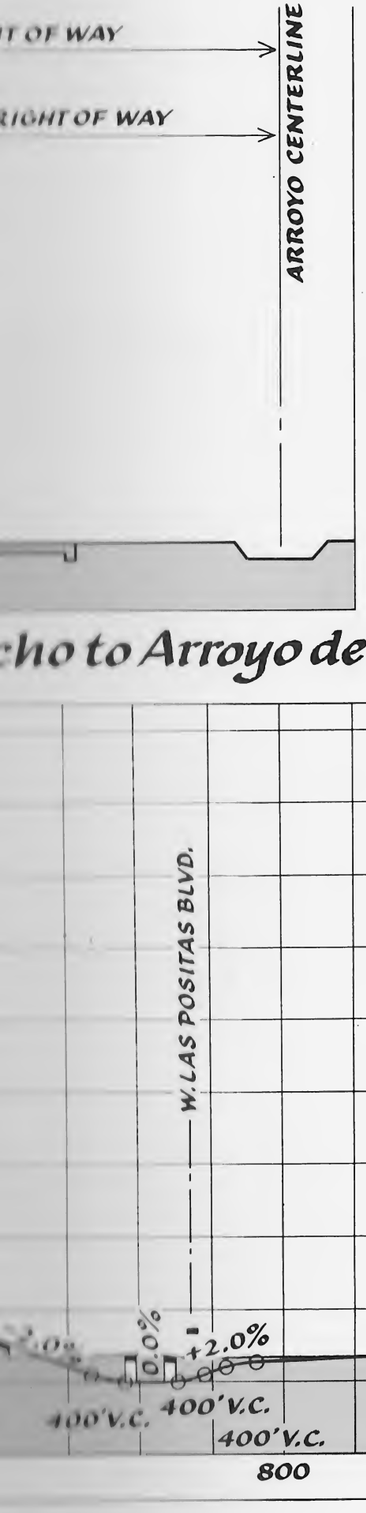
In Dublin, the BART alignment begins to rise relative to the descending grade of the adjacent freeway lanes and turns southeast, crossing over the eastbound freeway lanes on a 700 to 800 foot structure. The flat angle of the crossing and wide freeway will require very long spans for the overcrossing structure. To hold maximum span length to 200 to 250 feet, cantilever columns would be used. (The I-580 entry/exit structure plan is in the Bus Alternative chapter.) South of the overcrossing aerial structure, BART would descend on a 3 percent grade, crossing over the freeway frontage road (Old Dublin Road) and a local access road. Here a 500 foot segment of line would be in cut along the slope of Pleasanton Ridge. BART then would turn east on aerial structure, cross over Foothill Road and Laurel and Gold creeks, and enter the Dublin-Northwest Pleasanton Station. East of this station, the BART alignment would cross over Stoneridge Drive opposite the intersection with Springdale Avenue and continue on aerial structure along the south edge of Stoneridge Drive to the I-680 Freeway.



I-680 Freeway-Arroyo de la Laguna Section, Arroyo Mocho to Arroyo del Vall



I-580 to I-680 Alamo Canal Profile

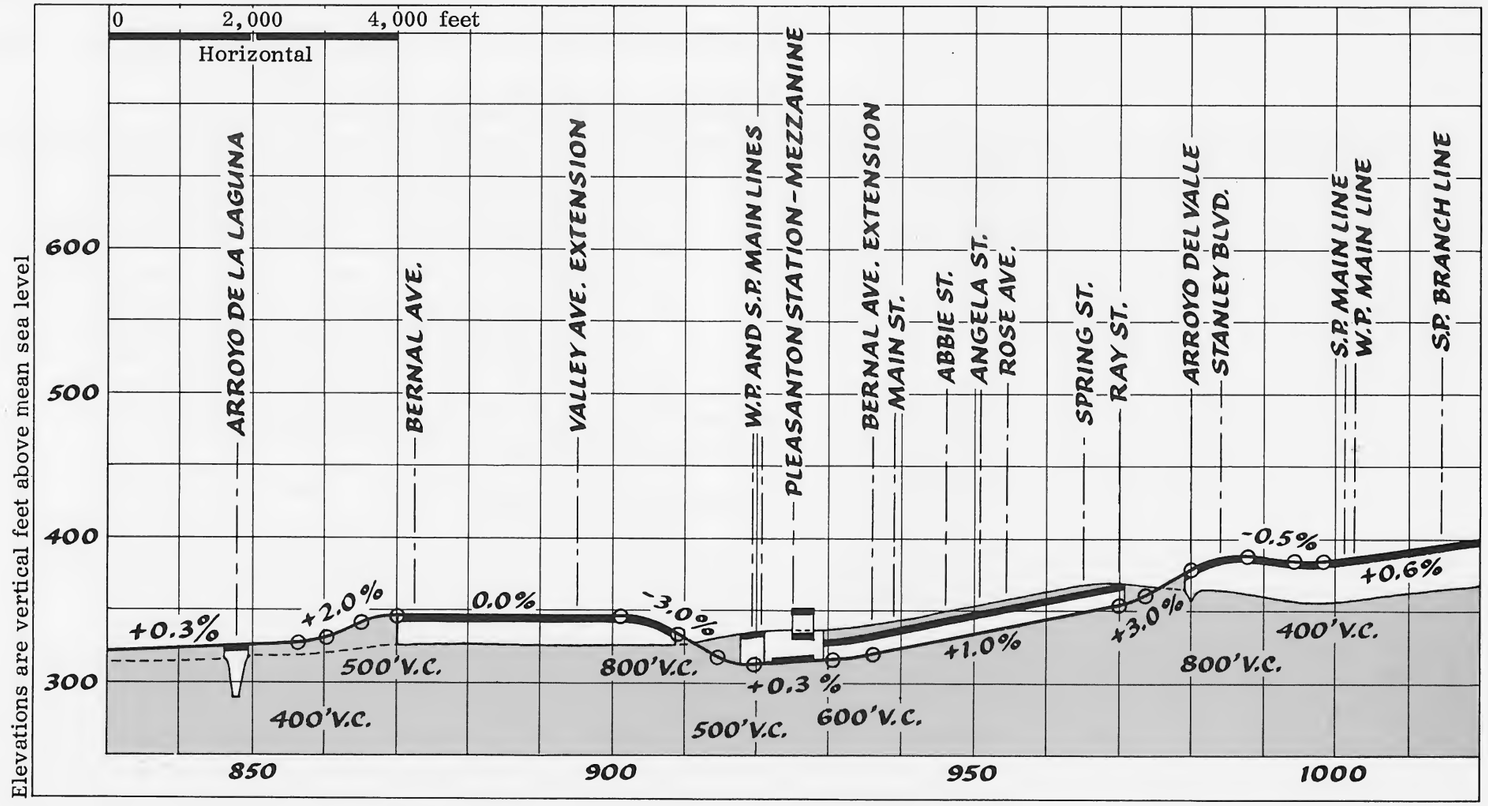


cho to Arroyo del Vall

The extension line would turn south, crossing over the freeway on a 900 foot structure with 200 foot spans and continue along the east edge of the freeway on aerial structure, straddling the right of way fence between the freeway and the Alamo Canal. Heading south, BART would descend first to grade and then to an open cut to cross under the proposed West Las Positas Boulevard interchange returning to grade about 900 feet south. The West Las Positas Boulevard interchange currently is not in the CALTRANS' Planning Program, but it is reasonable to assume that it will be built in the next 10 to 20 years.

The cross-section drawing for BART between the Arroyo Mocho and the Arroyo del Valle shows the BART alignment in relation to the Arroyo de la Laguna and the freeway. BART would occupy 26 feet of the freeway right of way and 14 feet of the Alameda County Flood Control and Water Conservation District right of way. Because planned freeway widening will take place within the median, BART's acquisition of 26 feet still would allow a minimum of 30 foot horizontal clearance between the edge of the pavement and the BART fence. The difference in grade between the freeway lanes, the BART alignment, and the top of the canal bank would require a retaining wall at the new freeway right of way line. To gain the additional 14 feet of right of way, it would be necessary to increase the slope of the flood control channel from the existing 2 to 1 to 1.5 to 1. The flood control channel would be lined with concrete so that its hydraulic capacity would not be impaired. At additional cost, a retaining wall could be built along portions of the channel, increasing the section enough to allow trees and shrubbery to be planted. A 12 foot access and maintenance road adjoining the channel would replace the existing access road.

Five hundred feet south of the Arroyo de la Laguna overcrossing, BART would rise and turn east over Bernal Avenue and continue on aerial structure 1,200 feet south of Bernal Avenue, crossing over the proposed extension of Valley Avenue. About 2,000 feet west of the Western Pacific Railroad tracks, BART



I-680/Alamo Canal to Radum Wye Profile

would begin to descend on a 3 percent grade in order to pass beneath the Western Pacific tracks and relocated Southern Pacific tracks in subway before entering Pleasanton Station. East of the station, BART would turn north, cross under the Bernal Avenue extension and Main Street and then continue north beneath the existing Southern Pacific right of way, crossing under Angela Street, Rose Avenue, Spring Street, and Ray Street.

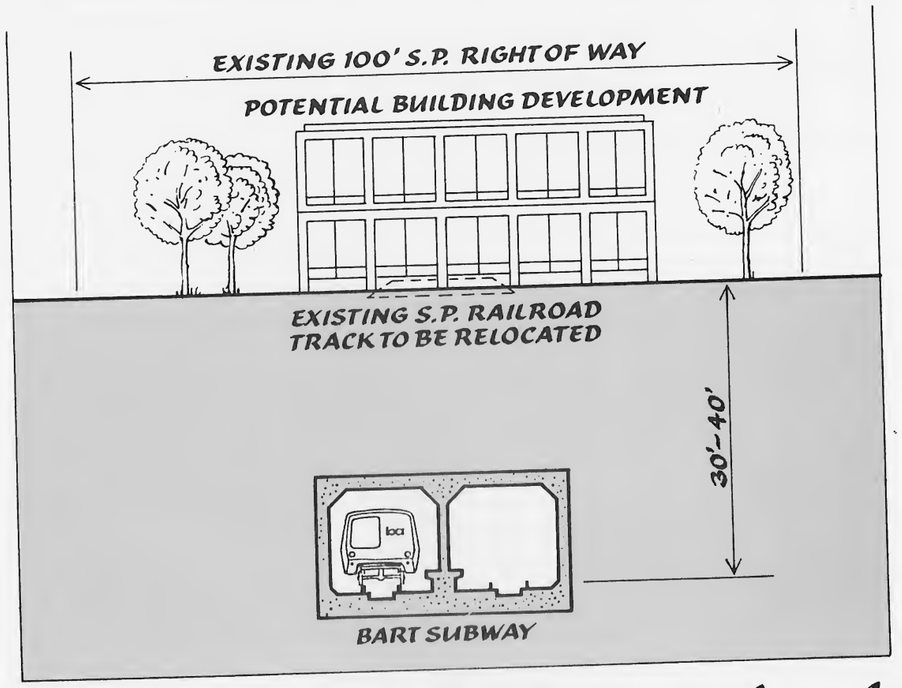
The Pleasanton section drawing shows how BART would be centered in the 100 foot wide Southern Pacific right of way. The existing Southern Pacific tracks would be relocated onto the Western Pacific right of way, and the space above the subway then would become available for retail and office development, parking, park, and open space.

Pleasanton Railroad Consolidation

To accommodate the selected BART alignment through downtown Pleasanton, the Southern Pacific tracks should be relocated on the Western Pacific right of way to permit cut and cover subway construction. The alternative would be a bored tunnel under the tracks at a cost premium approximately equal to the cost of railroad relocation plus a cut and cover subway.

The relocation of the Southern Pacific tracks would begin at a tangent point on the existing curved alignment under I-680, thus allowing the new track to follow a direct line toward the Western Pacific right of way without interfering with the existing freeway structure over the Southern Pacific tracks. After reaching the Western Pacific right of way, the Southern Pacific tracks would continue parallel to and 20 feet east of the Western Pacific tracks to the western edge of the Radum Wye. From here on, the offset between the Southern Pacific and the Western Pacific tracks gradually would increase until the relocated Southern Pacific tracks joined the existing Southern Pacific tracks east of the Radum Wye.

Underpasses would have to be built beneath the railroad tracks at Bernal Avenue, Mary Street, and Santa Rita Road, and a new bridge would be required to carry the Southern Pacific tracks across the Arroyo del Valle. Five grade crossings with the appropriate warning devices, modification of the existing Radum Wye, and the removal of the track and restoration of the track bed to pre-existing conditions along the abandoned route also would be required to complete the project. Once a decision is made to extend BART to the Valley, a detailed railroad consolidation study

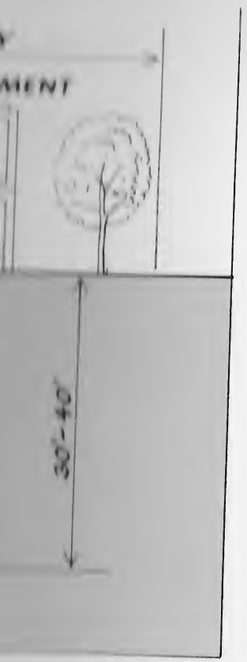


Pleasanton Subway Section, Angela Street to Ray Street

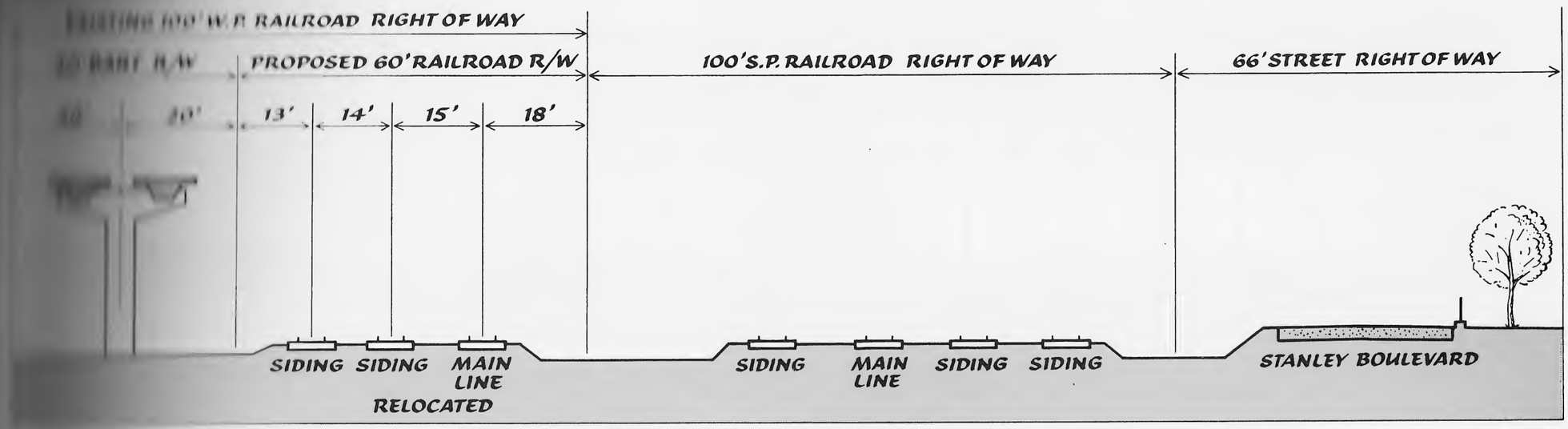
should be prepared to define the project precisely in terms that would justify approval by the State Public Utilities Commission. The total estimated cost of construction is $8 million.

Pleasanton to Livermore

North of Ray Street, BART would ascend to grade and then cross over the Arroyo del Valle on structure. North of the Arroyo, BART would continue on aerial structure over Stanley Boulevard, turn east over the tracks of the Western and relocated Southern Pacific Railroads, and then cross over the Southern Pacific-San Ramon branch line at the Radum Wye. Between this point and Livermore, BART would be located just north of the Western Pacific tracks and would cross over numerous railroad sidings serving the gravel pits to the north.



n, Angela



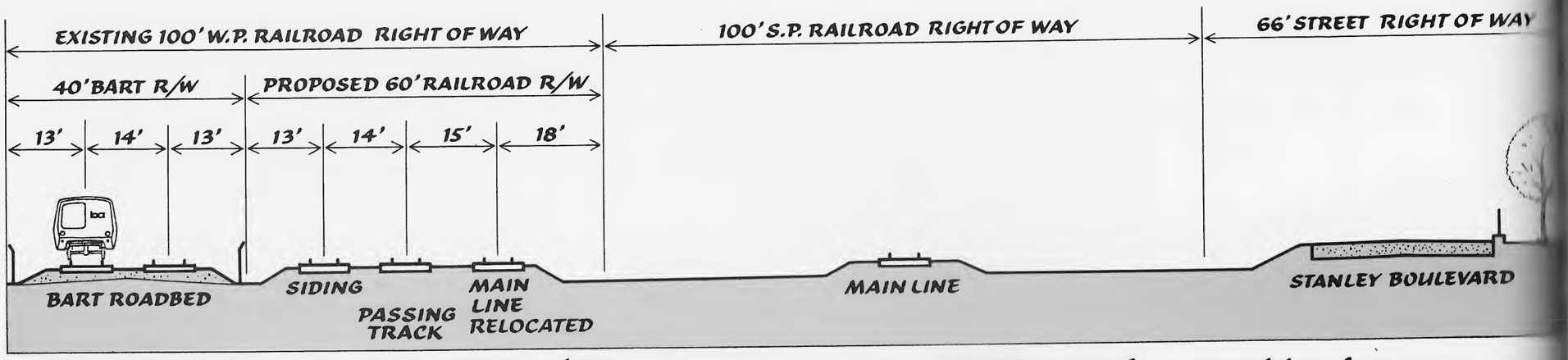
Aerial Section: Railroad/Stanley Blvd., Radum Wye to Gravel Pits

In the typical BART aerial section along Stanley Boulevard east of the Radum Wye, the Western Pacific Railroad main line is located in the center of the 100 foot railroad right of way. To accommodate a BART rail line within the Western Pacific right of way, the Western Pacific main line tracks must be relocated about 30 feet south to allow adequate space for two sidings north of the main line track. At the Western Pacific Railroad's request, a minimum vertical clearance of 23 feet would be provided under the BART aerial structure to permit rail service to shippers on sidings north of BART. Numerous Southern Pacific sidings also branch from either side of the main line to serve gravel operations north of the Western Pacific and south of Stanley Boulevard.

East of the gravel pits, the BART line descends to grade and continues into Livermore. The typical at grade section drawing shows the recommended relationship to the railroads and the lands to the north. While no sidings have been built along this segment of the railroad, most of this land west of the proposed Route 84 Freeway is reserved for expansion of gravel pits. East of the proposed Route 84 freeway undeveloped land is zoned for residential development. Consequently, it is unlikely that railroad sidings will be needed north of the BART alignment, and aerial structure would not be necessary. However, if additional rail service is required for the expanded gravel pit area, new track could be extended east from the existing sidings. Here too, the existing Western Pacific main line located in the center of the 100 foot right of way would have to be moved 30 feet south to make room for the proposed BART line as well as to allow for a future passing track and a possible siding. West of the proposed Route 84 Freeway, BART right of way would be increased from 40 to 55 feet for about 1,000 feet to permit construction of a pocket storage track between BART main line tracks.

About 1,000 feet west of Murrieta Boulevard, BART would turn northeast, cross over the Arroyo Mocho and the proposed Murrieta Boulevard underpass, and continue east at grade into the West Livermore Station. The station platform located north of the Western Pacific tracks and the station parking area south of the relocated Southern Pacific tracks would be connected by a pedestrian tunnel.

Through Livermore, the proposed BART alignment would be at grade immediately north of the Western Pacific tracks.



At Grade Section: Railroad/Stanley Blvd., Gravel Pits to Arroyo Mocho

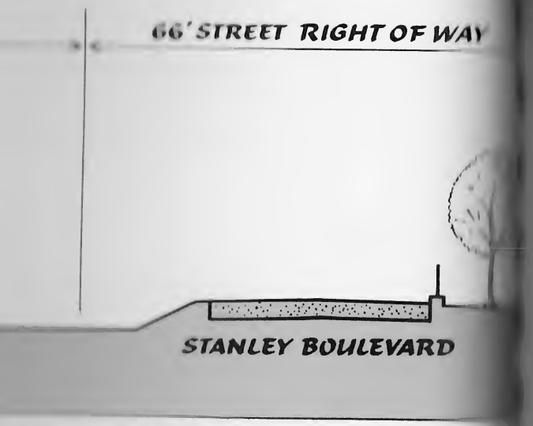
Livermore Railroad Consolidation

Certain railroad relocation and railroad grade separation projects must be completed at or prior to the time that the BART line is constructed through Livermore. The scope of the projects is dependent on the degree of completion of the Phase Two Livermore Main Line Railroad Consolidation Project prior to BART construction.

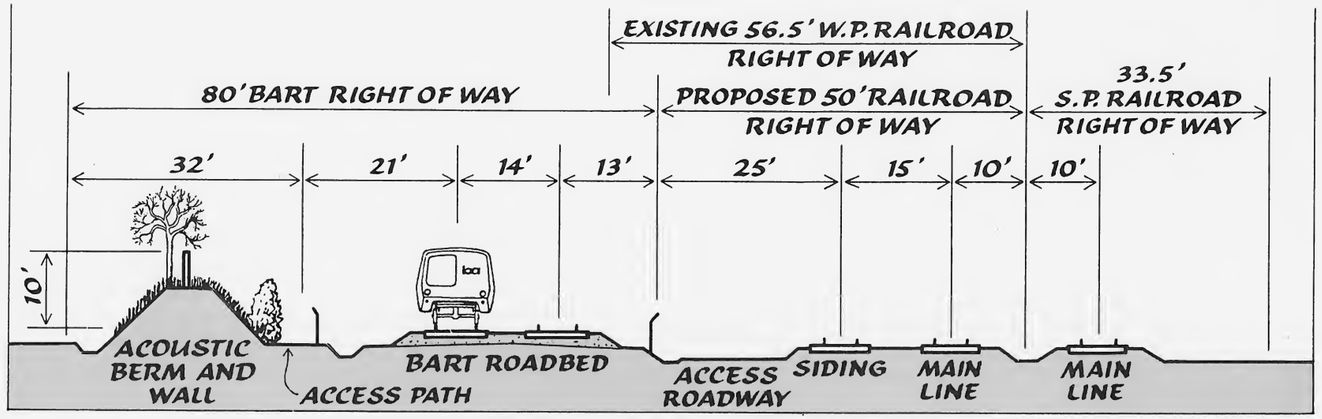
At present, the Livermore consolidation project consists of the relocation of approximately 2 miles of the Southern Pacific main line onto the Western Pacific right of way. The initial phase, for which construction started in April 1974, begins at Murrieta Boulevard in west Livermore and ends in east Livermore where the existing alignments adjoin. Underpasses are being constructed at North Livermore Avenue and North "P" Street. Phase One is expected to be completed by mid-1975. Following this phase, other related traffic circulation improvements will proceed, including the western extension of Railroad Avenue to Stanley Boulevard, the opening of a new connection between First Street and Fourth Street, the southern extension of Junction Avenue, and the opening of other crosstown city streets.

Subsequent phases will include an overpass to carry the relocated First Street over the consolidated rail corridor. Excavated material from the two underpasses now under construction is being placed in the approach embankments for the future overpass and rights of way are being acquired.

In west Livermore, a future underpass will carry Murrieta Boulevard under the railroad tracks, with a short section of Southern Pacific track relocated parallel to the Western Pacific. A new railroad bridge would cross the Arroyo Mocho. In this later phase, the City will have the opportunity of eliminating or separating the remaining grade crossings in downtown Livermore, namely Junction Avenue and North "L" Street. Detailed planning for the next steps in the comprehensive track relocation and grade separation program will depend upon the availability of local funds and State matching grants and a decision on a BART extension.



rroyo Mocho



Downtown Livermore Section, "N" Street to "I" Street

Through Livermore, BART is planned on an at grade alignment along the north side of the Western Pacific railroad. Therefore, all remaining at grade crossings must be eliminated. Because the timing of the BART extension as well as the timing of the later phases of the railroad consolidation and grade crossing elimination program are not known, it is difficult to determine how much work will remain to be done.

In east Livermore, railroad crossings at Trevarno Road and at the proposed Mines Road extension must be either grade separated or eliminated at the time of the BART extension. Because Trevarno Road is a private railroad crossing, it is questionable whether State Railroad Grade Crossing Elimination Funds can be used. Either the crossing would have to be closed or BART would have to pay the entire cost of the grade separation. In the case of the Mines Road extension, the City would be eligible for matching funds from the State program with the matching percentage dependent on the future status of the grade crossing. This source could be supplemented by BART construction funds if the timing of the two projects coincide. These two grade separations could be underpasses or overpasses. Initial design investigations indicate that at least the Mines Road extension grade separation should be an underpass. If overpasses are built, they should be designed to accommodate BART at a future date.

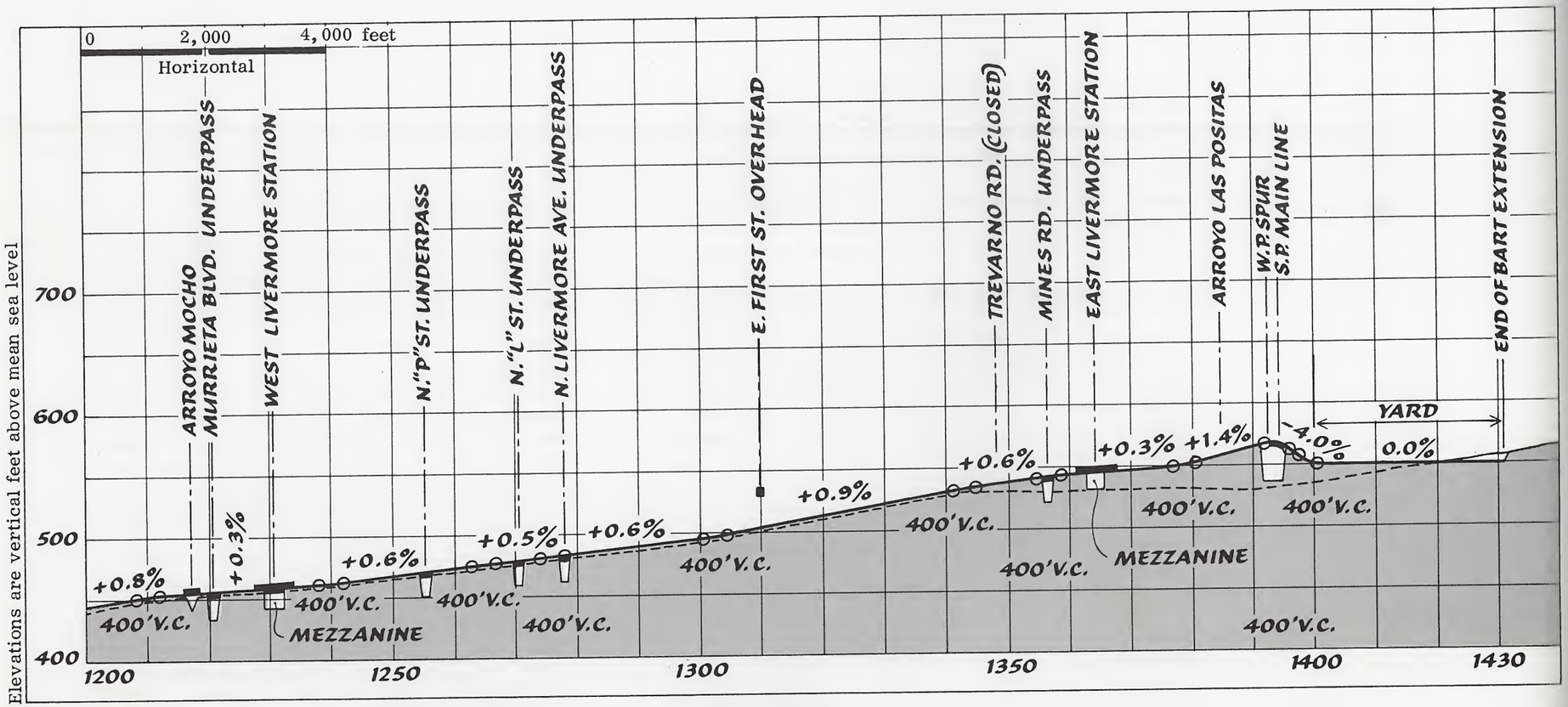
Livermore to the BART Yard

The downtown Livermore section shows the combined rail corridor through Livermore with the relocated Southern Pacific main line south of the Western Pacific main line. North of the existing Western Pacific tracks, space would be provided for a future Western Pacific track as well as 25 feet between the centerline of the future track and the BART fence for a maintenance roadway. BART would occupy 6.5 feet of the Western Pacific right of way. An additional 33.5 feet of right of way would be acquired to accommodate BART and another 40 feet would be needed to build a landscaped acoustic berm that would reduce BART and railroad noise in adjacent residential neighborhoods.

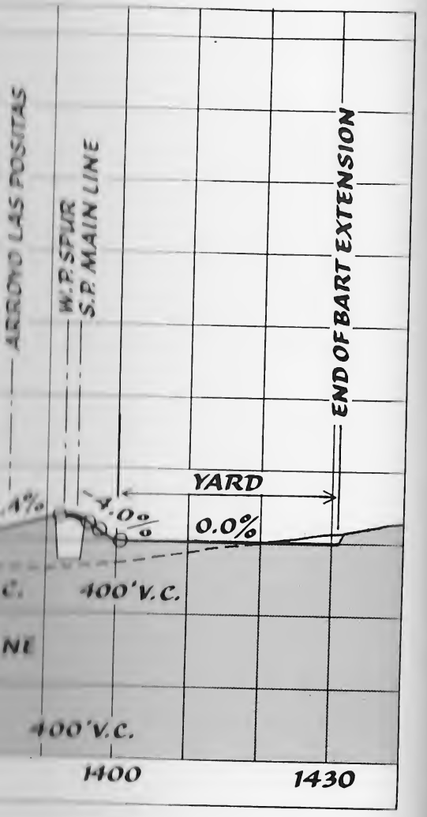
In areas of non-residential development where an acoustic berm would not be built and in areas involving difficult right of way acquisition, the BART right of way could be reduced to 40 feet. Within a 40 foot right of way a sound wall could be built in place of the standard chain link fence to achieve equivalent sound reduction without additional right of way.

East of the First Street overpass, the BART alignment would climb on embankment, cross over the proposed Mines Road undercrossing, and enter the East Livermore Station. Seven hundred feet west of the Mines Road crossing, the extension line would cross Trevarno Road, a private road serving an industrial plant south of the Western Pacific and Southern Pacific railroads. It is proposed that Trevarno Road be closed at the BART track, with access to be provided from the south.

East of the East Livermore Station, BART would cross over a relocated Western Pacific siding and the Southern Pacific main line and would descend into the BART yard. The Western Pacific siding serving an industrial facility just west of Vasco Road would be relocated 30 feet south to make room for the BART line.



Murrieta Blvd. to Livermore Yard Profile



ALIGNMENT ALTERNATIVES

Pleasanton

The proposed BART subway through Pleasanton would extend from a point west of the Western Pacific main line to a point north of Ray Street. The City of Pleasanton requested study of a subway extension west beyond Bernal Avenue. With this alternative, the cut and cover subway would continue from the Western Pacific tracks west across the San Francisco Water Department land underneath the proposed Valley Avenue extension, and then swing north, crossing underneath Bernal Avenue. There, the BART tracks would rise to grade and join the selected BART alignment. This alternate alignment would have the advantage of eliminating visual intrusion and adverse noise impacts within the planned industrial area. The construction cost premium for this alternative would be $11 million.

Pleasanton to Livermore

An alternative to the proposed alignment between Pleasanton and Livermore would be to locate BART at grade between the Western Pacific and Southern Pacific railroad tracks in order to reduce the amount of aerial structure along this line segment. However, that objective could not be fully realized because aerial structure still would be needed to permit continued vehicle access to the gravel pits and adjacent properties at six existing railroad crossings and to accommodate the proposed extension of Fallon Road. A second drawback to this alternative is the required reconstruction of the conveyor belt carrying gravel over the Western Pacific tracks to the north siding of the Southern Pacific. Finally, west of Murietta Boulevard in West Livermore, BART would have to cross over the Western Pacific tracks to enter the West Livermore Station on an aerial structure requiring long spans dictated by the shallow angle. Because of these constraints, no significant construction cost savings are likely with this alternative alignment.

Livermore

As an alternative to the at grade alignment north of the Western Pacific tracks, BART could be built underground through central Livermore. The horizontal alignment of this alternative would place BART south of the Southern Pacific tracks between Murrieta Boulevard and the Western Pacific crossing over the Southern Pacific east of the East Livermore Station. East of Murrieta Boulevard, BART would drop below grade, pass under the existing Western Pacific and relocated Southern Pacific tracks, and proceed in cut and cover subway 35 to 40 feet below grade to a West Livermore Subway Station located north of the Railroad Avenue/Stanley Boulevard intersection, approximately 1,000 feet east of the recommended West Livermore Station. East of the West Livermore Subway Station, BART would continue in cut and cover subway under Railroad Avenue to a point 200 feet west of the Railroad Avenue/First Street intersection. There, it would cross under First Street and the Junction Avenue extension and ascend to grade at the planned First Street overpass. East of the overpass, BART would continue at grade along the south side of the relocated Southern Pacific tracks past Traverno Road and cross over the Mines Road extension and enter an East Livermore Station south of the Southern Pacific tracks.

Trevarno Road would be closed at the Southern Pacific tracks. Access to the land located between the Western Pacific and Southern Pacific would be provided via the remaining at grade crossing at the Western Pacific or via a new east-west access road. East of this station, BART would remain at grade parallel to the Southern Pacific tracks, cross under the Western Pacific overcrossing, and enter the BART yard. To accommodate the BART tracks under the Western Pacific, a new Western Pacific overcrossing structure would have to be constructed at great cost or a BART tunnel would have to be built under the Western Pacific embankment. The additional construction cost of the Livermore subway alternative would be about $40 million.

STATION PLANS

Castro Valley Station Alternates

Five Castro Valley station locations were analyzed during the study. No site was selected by the Board of Control as the preferred location for a BART station. Instead, the Board decided that more detailed studies would be required before a final selection could be made, and these most appropriately should be conducted after a decision is made on whether or not BART should be extended to Livermore and Pleasanton. For purposes of cost estimating and impact analysis, the characteristics of the Castro Valley Station at North Lake Chabot Site #2 shown in the inset box, were assumed.

Northeast Redwood Road Site

This station site, located in the northeast quadrant of the Redwood Road/I-580 interchange would displace 54 housing units and seven businesses. Although access to the site would be adequate during the morning, in the evening, commuters would have to contend with shopping traffic congestion.

Northwest Redwood Road Site

If a BART station were located on this site, 31 housing units and nine businesses would be displaced, and the station parking lot would be split by Wilbeam Avenue.

While the service area and accessibility to this site are similar to the northwest Redwood Road site, a signal would be required to handle heavy traffic turning left from the station onto Redwood Road.

North Lake Chabot Site #1

A BART station on the west side of an extension of Lake Chabot Road from Castro Valley Boulevard to Norbridge Avenue would displace 36 housing units and nine businesses. Access would be superior to the Redwood Road and South Lake Chabot sites with no out of direction travel, although Castro Valley Boulevard will be congested. Planned high density residential development near the site would create potential for walk-in patronage.

North Lake Chabot Site #2

This station site on the north side of the I-580 Freeway between Redwood Road and the extension of Lake Chabot currently is occupied by 73 single family houses and 4 duplexes. Access to a BART station on this site would be the best of the sites studied if Chester Street were extended south to serve as an alternate connecting route between the station and Castro Valley Boulevard, allowing motorists to avoid congestion on Redwood Road. The single family tract south of the freeway is expected to remain, while multi-family housing is planned for the north side.

South Lake Chabot Site

On the south side of I-580 near Strobridge Avenue, this BART station site would be split by an extension of Lake Chabot Road under I-580. Eighty-eight housing units would have to be removed. Access would be good except for the anticipated congestion on Castro Valley Boulevard, but the walk-in potential would not be as great as for the North Lake Chabot Road site.

The Redwood Road sites would suffer from potential access problems due to heavy traffic on Redwood Road and the conflict with adjacent commercial uses. Opportunities for walk-in patronage around these sites are limited, and BART-oriented residential development would be unlikely. In addition, both Redwood Road sites are located east of the center of Castro Valley and, therefore, would result in out of direction travel for many Castro Valley BART patrons. The North Lake Chabot Sites were judged preferable to the site south of the freeway because they would provide better service for the majority of Castro Valley residents, they would capitalize on the walk-in potential from nearby planned high density residential development, and they would not require extension of Lake Chabot Road under I-580. Either a station south of the freeway or the North Lake Chabot site #2 would cause major neighborhood disruption.

To meet BART line profile standards, the station platform for the North Lake Chabot Site #1 and the South Lake Chabot Site would have to be about 20 feet above the grade of the adjacent freeway lanes, requiring extensive retaining walls and twice the normal climb for stairs and escalators. The station site east of Lake Chabot Road would not have these drawbacks.

CASTRO VALLEY STATION (characteristics assumed for impact analysis)

LAKE CHABOT/NORBRIDGE

11 Acres
915 Parking Spaces

STATION AREA 1,500 FOOT IMPACT ZONE

Proposed Land Use (Acres)

Single Family	84
Multi-family	67
Commercial	1
Office	--
Industrial	--
Open Space	7
BART Station	11
Rights of Way	31
Other Public	--
Population, 1990 est.	4,600
Employment, 1990 est.	150

PATRONAGE, 1990

BART

Work Trips	1,500
Non-work Trips	1,100
Total Trips	2,600

Feeder Bus

Daily	600
Peak Hour	200

STATION SITE DISPLACEMENT

Housing Units	81
Businesses	--

Dublin-Northwest Pleasanton Station

The first station in the Valley, located at the south edge of the proposed Stoneridge Shopping Center, would play an integral part in the development of the surrounding area. Currently, the regional shopping center is designed to include five major department stores directly north of the station. The development plan indicates commercial uses east and west of the proposed station site on the north side of Stoneridge Drive and apartments south of the station. Apartments also are planned to be built east of the commercial development alongside the I-680 Freeway.

Access would be provided by Foothill Road, Stoneridge Drive, and the Springdale Avenue extension. The existing Foothill Road interchange would provide access to I-580, and the proposed Stoneridge Drive interchange would connect to I-680. The proposed internal station circulation connecting with the adjacent street system on four sides of the station would help distribute station traffic and lessen congestion. However, the station would suffer the same congestion as the shopping center, especially during the evening peak periods when commuter and shopper trips coincide.

By 1995, CALTRANS forecasts that Foothill Road will carry less than 40,000 vehicles per day south of I-580 in the vicinity of the shopping center, and almost 60,000 vehicles per day north of the freeway. Consequently, vehicles crossing I-580 on Foothill Road will encounter serious congestion. Traffic volumes on Foothill Road south of Stoneridge Drive and on I-680 south of I-580 are anticipated to be relatively light. Hopyard Road south of West Las Positas Boulevard and West Las Positas Boulevard west of Hopyard Road will experience serious congestion. Stoneridge Drive between Foothill Road and Hopyard Road would carry only light traffic. All these traffic loadings assume a freeway overcrossing at Stoneridge, but no interchange. If an interchange is built at Stoneridge, it can be expected to divert traffic from West Las Positas Boulevard, providing for better traffic distribution, reduced congestion, and improved freeway access. An interchange at Stoneridge also would divert north-south traffic destined for the shopping center or the station away from the congested sections of Foothill Road onto I-680. With a full interchange at Stoneridge Drive, access to this station would be very good.

Transit feeder service to BART and the proximity of the BART station to the shopping center could alleviate the congestion even further. It is proposed that a people mover connect BART directly to the shopping center. In addition, a "bus only" road is proposed to deliver bus transit patrons directly to the front door of the shopping center. Because the shopping center is not yet under construction, it should be possible to coordinate development of the station and the shopping center, avoiding on-site traffic conflicts.

This station would serve not only northwest Pleasanton but also Dublin and San Ramon. Most transit patrons would arrive from the north via I-680 or Foothill Road, probably prefering the more smoothly flowing freeway over congested Foothill Road if a full interchange at Stoneridge Drive were built.

The 700 foot station platform would be located near the southeast corner of the site because of horizontal alignment requirements. A clockwise vehicular loop would provide circulation around the mezzanine area and would serve the drop off area. Off peak parking would be located immediately south of the mezzanine, and long term parking to the north and west. To improve traffic flow, left turn movements on Stoneridge Drive would be confined to intersections.

DUBLIN-NORTHWEST PLEASANTON STATION

STONERIDGE/FOOTHILL

23 Acres
2,300 Parking Spaces

STATION AREA 1,500 FOOT IMPACT ZONE

Proposed Land Use (Acres)	
Single Family	19
Multi-family	67
Commercial	71
Office	—
Industrial	—
Open Space	13
BART Station	23
Rights of way	17
Other Public	—
Population, 1990 est.	3,600
Employment, 1990 est.	4,000

PATRONAGE, 1990

BART	
Work Trips	7,500
Non-work Trips	3,000
Total Trips	10,500
Feeder Bus	
Daily	2,600
Peak Hour	870

STATION SITE DISPLACEMENT

Housing Units	—
Businesses	—

Dublin-Northwest Pleasanton Station Schematic Site Plan

Pleasanton Station

This station would be east of the Western Pacific tracks and south of the Bernal Avenue extension. Access would be from Bernal Avenue and Sunol Boulevard, both projected to become four lane thoroughfares. Without railroad relocation, all station access would be from Bernal Avenue, causing significant congestion. Heavy rail traffic resulting from track consolidation would require construction of a grade separation, preferably an underpass, at Bernal Avenue. Pleasanton Avenue then could be extended south to the Valley Avenue extension with a partial interchange connection to Bernal Avenue.

The City's central business district lies to the north across Bernal Avenue, and the Civic Center, offices and apartments would be within easy walking distance. Most of this land presently is in residential and commercial use.

This station would have excellent vehicular access. CALTRANS 1995 traffic projections indicate relatively little congestion on Bernal Avenue, Sunol Boulevard, First Street, Pico Avenue, and Valley Avenue. In Pleasanton, only major downtown streets would experience peak period congestion. The Pleasanton Station would serve north Pleasanton up to Valley Avenue, and all of central, south, and east Pleasanton. BART patrons living north of Valley Avenue would find the Dublin-Northwest Pleasanton Station more convenient.

The Alameda County Fairgrounds northwest of the station should not be faced with as much auto congestion during major events once BART is in operation. The unincorporated agricultural lands southwest of the proposed station are owned by the San Francisco Water Department with light industry the use indicated by the Pleasanton General Plan. The City's sewage treatment plant on Sunol Boulevard is planned to be phased out in the near future.

As at the Dublin-Northwest Pleasanton Station, the 700 foot station platform would be located near the southwest corner of the site because of horizontal alignment requirements. The mezzanine would be at ground level, with the BART tracks one level below. To reduce the width of the cut and cover subway trench, side platforms are proposed. Because the subway would be relatively shallow, the station could be built in an open cut, thereby leaving most of the platform area open to the sky. Vehicular circulation around the mezzanine area would be provided by a counterclockwise loop. Drop off and off peak parking facilities would be provided both north and south of the mezzanine. Long term parking would be provided on the outer portions of the site. Right and left turns would be permitted at the access road intersections on the Bernal Avenue extension and Sunol Boulevard/ First Street. However, at least two of these intersections should have signals to handle peak period traffic.

PLEASANTON STATION

BERNAL/MAIN

22 Acres
2,200 Parking Spaces

STATION AREA 1,500 FOOT IMPACT ZONE

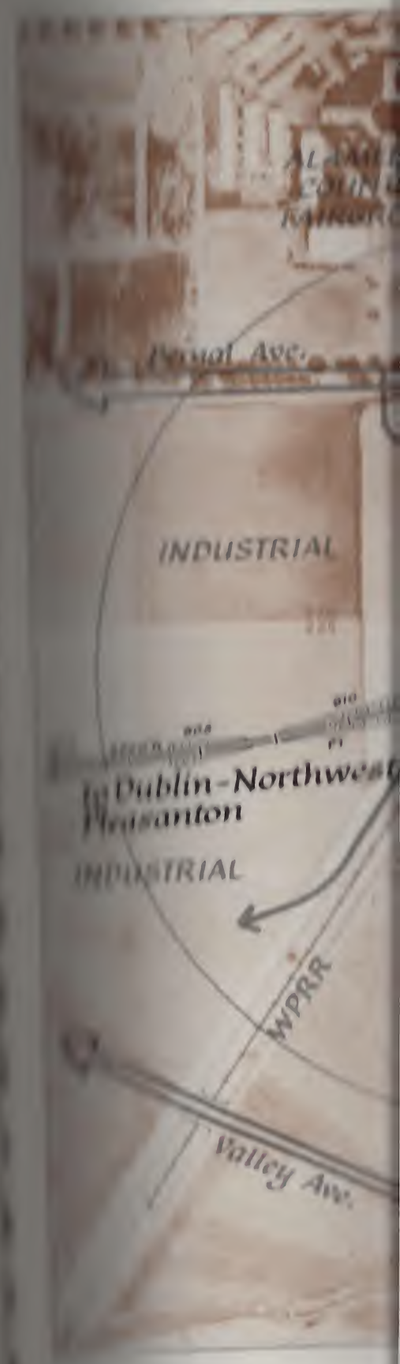
Proposed Land Use (Acres)	
Single Family	—
Multi-family	13
Commercial	—
Office	18
Industrial	81
Open Space	10
BART Station	22
Rights of way	29
Other Public	37
Population, 1990 est.	650
Employment, 1990 est.	1,400

PATRONAGE, 1990

BART	
Work Trips	7,000
Non-work Trips	3,000
Total Trips	10,000
Feeder Bus	
Daily	2,500
Peak Hour	830

STATION SITE DISPLACEMENT

Housing Units	—
Businesses	—



Pleasanton Station Schematic Site Plan

West Livermore Station

A stable single family residential area lies north of this station, Valley Memorial Hospital is located south of Stanley Boulevard, and Livermore's newest retail outlets adjoin to the east along First Street. The station site would be located south of the relocated Southern Pacific tracks. The site would be bounded by the Arroyo Mocho, Stanley Boulevard and an extension of Holmes Street. Under the present railroad consolidation plan, the Southern Pacific railroad tracks ultimately will be moved north alongside the Western Pacific tracks. This move will free presently vacant land north of Stanley Boulevard for the BART station parking lot as well as planned commercial and office uses. Single family residential development and open space are the planned uses to the west along the Arroyo Mocho to Isabel Avenue, where sand and gravel extraction activities begin. Twenty-six single family residences located north of the railroad tracks would have to be acquired to accommodate the West Livermore BART Station.

Access to the station would be from Stanley Boulevard, but pedestrians would be able to enter from the north through an underpass. The portion of the parking area west of Murrietta Boulevard would be reserved for long-term parking and connected to the main station area by an auto bridge across the depressed streets. This site design eliminates any need for BART patrons southbound on Murrieta to make a left-hand turn onto Stanley Boulevard. From the south, most patrons would arrive on Holmes Street and Fenton Avenue.

CALTRANS 1995 traffic projections show over 45,000 vehicles per day on Stanley Boulevard west of Murrieta Boulevard and 30,000 to the east. Murrieta Boulevard is expected to carry 14,000 daily vehicles south of Stanley Boulevard and almost 20,000 daily vehicles north of Stanley Boulevard. These volumes will cause significant peak period congestion on Stanly Boulevard from Murrieta Boulevard west. However, only light congestion would be experienced on Stanley Boulevard in front of the station. These traffic projections assume the completion of the State Route 84 Freeway through west Livermore. If this freeway is not completed, Livermore will have to absorb an additional 40,000 vehicles per day on its north-south arterials, which would increase congestion on Murrieta Boulevard, North "P" Street, and North "L" Street.

The center 700 foot platform would be located at grade, north of the railroad tracks. To reach the parking lot, patrons would walk down to the mezzanine area below the station platform and then cross under the tracks. Only pedestrian access from El Rancho Drive is proposed in order to minimize neighborhood disruption. A counterclockwise loop would provide vehicular access to the station entrance and the off peak parking area, and two-way access roads would connect the loop with adjacent streets. The Fenton Avenue/Stanley Boulevard intersection probably would require a traffic signal.

WEST LIVERMORE STATION

STANLEY/MURRIETA

24 Acres
2,400 Parking Spaces

STATION AREA 1,500 FOOT IMPACT ZONE

Proposed Land Use (Acres)	
Single Family	95
Multi-family	—
Commercial	20
Office	35
Industrial	—
Open Space	6
BART Station	24
Rights of way	18
Other Public	12
Population, 1990 est.	1,400
Employment, 1990 est.	1,500

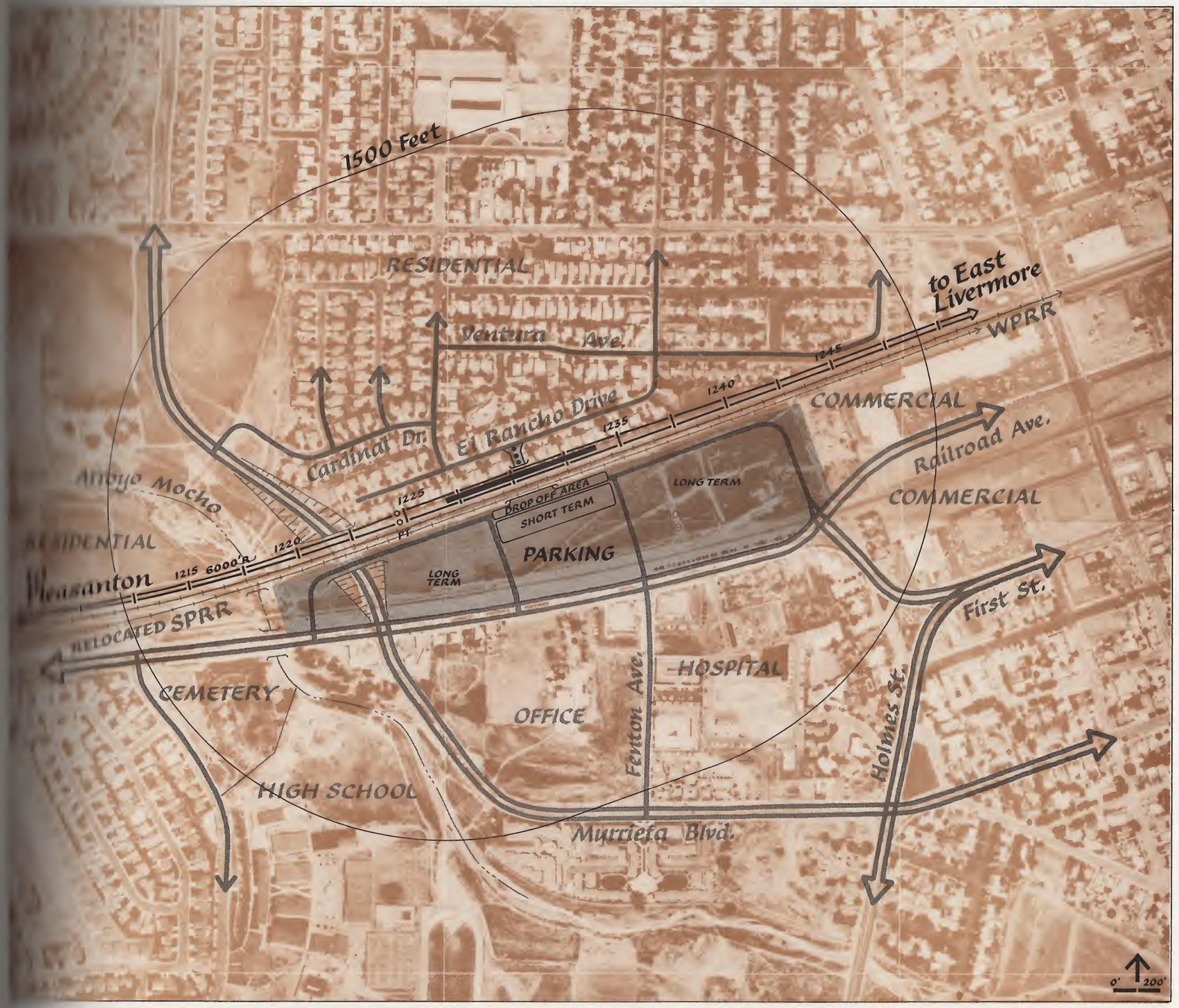
PATRONAGE, 1990

BART	
Work Trips	6,700
Non-work Trips	4,200
Total Trips	10,900
Feeder Bus	
Daily	2,700
Peak Hour	900

STATION SITE DISPLACEMENT

Housing Units	26
Businesses	—

West Livermore Station Schematic Site Plan



GE, 1990

	6,700
Trips	4,200
	10,900
	2,700
	900
SITE DISPLACEMENT	
nits	26
	—

East Livermore Station

This station, serving the eastern half of Livermore, is the last station on the selected BART line. It is on the north side of the Western Pacific railroad tracks east of Mines Road which is planned to connect First Street to East Avenue. Most of the land within 1,500 feet of the station is vacant. One new warehouse building is located on the station site. Trevarno Road homes and businesses are located to the east. According to the Livermore General Plan, this station area should be developed for industrial use except for the lands north of First Street where residential uses would be permitted. The area south of Patterson Pass Road extension also will be developed for residential use.

Access to the East Livermore Station would be provided by First Street and an extension of Mines Road. The Southern Pacific passing track at the proposed Mines Road railroad crossing and the low BART embankment dictate a grade separation for the Mines Road extension. An underpass design, desirable because of profile requirements, would permit access to the property between the Western Pacific and Southern Pacific tracks.

CALTRANS 1995 traffic projections indicate that only First Street will experience any congestion with daily traffic volumes of 30,000 and 37,000 vehicles west and east of Mines Road. Congestion would occur primarily during the morning peak periods when commuters would be turning left into the East Livermore Station.

The existing Western Pacific drill track must be relocated south to make room for the BART embankment. In its new location, it would cross under the BART track immediately north of the BART/Southern Pacific crossing.

The 700 foot station platform would be located 15 feet above the ground to enable BART to cross over the Southern Pacific tracks 2,000 feet east of the station, and the mezzanine would be at grade. The proposed side platforms would reduce the width of the embankment. A counterclockwise loop provides vehicular access to the drop off area opposite the mezzanine. Off peak parking would be north of the drop off area with long term parking to the west, north, and east. Two north-south circulation roads would connect both ends of the traffic loop with First Street, and an east-west circulation road along the north station perimeter would provide access to Mines Road.

This station would serve as the terminal station of the Livermore BART Extension. During normal operations, eastbound trains would cross over to the westbound track at a crossover provided west of the station and enter the station on that track. The train would then reverse direction and leave the station via the same track. For operational flexibility, a second crossover is provided east of the station. Eastbound trains returning to the yard would remain on the eastbound track.

EAST LIVERMORE STATION

MINES/FIRST

17 Acres
1,640 Parking Spaces

STATION AREA 1,500 FOOT IMPACT ZONE

Proposed Land Use (Acres)

Single Family	16
Multi-family	—
Commercial	—
Office	—
Industrial	128
Open Space	—
BART Station	17
Rights of way	49
Other Public	—
Population, 1990 est.	250
Employment, 1990 est.	2,000

PATRONAGE, 1990

BART

Work Trips	5,300
Non-work Trips	2,200
Total Trips	7,500

Feeder Bus

Daily	1,900
Peak Hour	640

STATION SITE DISPLACEMENT

Housing Units	—
Businesses	4

East Livermore Station Schematic Site Plan

, 1990

	5,300
rips	2,200
	7,500
	1,900
	640

E DISPLACEMENT

	—
	4

TABLE 11. LIVERMORE-PLEASANTON BART EXTENSION ESTIMATED TRAVEL TIMES, SELECTED ROUTE
(Minutes)

To \ From	Dublin-Northwest Pleasanton Station	Pleasanton Station	West Livermore Station	East Livermore Station
Bay Fair	0.0[a]	0.0[a]	0.0[a]	0.0[a]
	0.0	0.0	0.0	0.0
	12.0	16.4	22.4	25.6
	12	16	22	26
Fremont	15.0	15.0	15.0	15.0
	3.5	3.5	3.5	3.5
	12.0	16.4	22.4	25.6
	31	35	41	44
Lake Merritt	13.0	13.0	13.0	13.0
	3.5	3.5	3.5	3.5
	12.0	16.4	22.4	25.6
	29	33	39	42
City Center (12th Street – Oakland)	15.0	15.0	15.0	15.0
	5.0	5.0	5.0	5.0
	12.0	16.4	22.4	25.6
	32	36	42	46
MacArthur	19.0	19.0	19.0	19.0
	5.0	5.0	5.0	5.0
	12.0	16.4	22.4	25.6
	36	40	46	50
Richmond	34.0	34.0	34.0	34.0
	5.0	5.0	5.0	5.0
	12.0	16.4	22.4	25.6
	51	55	61	65
Concord	45.0	45.0	45.0	45.0
	5.0	5.0	5.0	5.0
	12.0	16.4	22.4	25.6
	62	66	72	76
Walnut Creek	38.0	38.0	38.0	38.0
	5.0	5.0	5.0	5.0
	12.0	16.4	22.4	25.6
	55	59	65	69
Rockridge	24.0	24.0	24.0	24.0
	5.0	5.0	5.0	5.0
	12.0	16.4	22.4	25.6
	41	45	51	55
Powell Street (S. F.)	26.0	26.0	26.0	26.0
	5.0	5.0	5.0	5.0
	12.0	16.4	22.4	25.6
	43	47	53	57

(a) 15.0 BART Main Line Travel Time (From Transfer Station to Destination)
3.5 Transfer Penalty
22.4 BART Extension Travel Time
41 Total Travel Time (rounded off to nearest minute)

Source: De Leuw, Cather and Company

TRAVEL TIMES

Estimated travel times from stations on the Livermore-Pleasanton BART Extension to selected stations on the existing BART system are shown in Table 11. For Pleasanton residents, the trip to the Oakland City Center BART Station would take from 32 to 36 minutes depending on which Valley station they chose. From Livermore, the same trip would last 42 to 45 minutes. San Francisco would be 43 to 57 minutes away for Valley BART patrons. If through service were established, the travel times indicated would be reduced by the 3.5-5 minute transfer penalty, depending on which BART line is extended to Livermore.

EQUIPMENT SPECIFICATIONS, TRACK CRITERIA, AND SUPPORT FACILITIES

A small yard at the Livermore end of the line is needed to support train operations because the extension is essentially separate from the main line.

Equipment Specifications

The Livermore Line must be viewed as a direct extension of the BART system. Even though revenue service operations will be separate, BART trains should be able to run on either the basic system or the extension at any time and it will be necessary to shift vehicles from the Livermore Yard to the Hayward Yard for heavy maintenance.

Train Control

Wayside and local train control equipment should be based on the latest configuration of BART equipment.

Monitoring and supervision of train and equipment systems would be integrated with the present Operations Control Center. There is sufficient space available to display schematically this line on the existing boards and computer capability to supervise the operation, although adjustments in computer programs and equipment would be necessary. No additional personnel would be required to monitor and supervise the Livermore control operation.

Communications

Communications and data transmission requirements should be guided by criteria of the existing BART system.

Power Electrification

Engineering design requirements are similar to the existing BART system.

Vehicles

As indicated, the vehicles used on the Livermore Line also would be used interchangeably on the trunk lines; therefore, vehicle criteria must be identical with existing vehicles.

Track Criteria

The horizontal and vertical alignments were designed to meet or exceed current BART standards so that train speeds would not have to be reduced on curves. The minimum radius used on the Livermore Line is 1,300 feet to allow a safe operating speed of up to 55 MPH and to avoid "wheel squeaking" that occurs on the existing system with 500 foot horizontal curves.

Crossovers would be placed 7.5 minutes apart to permit 15 minute headway operation on one track in an emergency. To allow for storage of dead trains at convenient locations along the Livermore Line and occasional daytime storage of track maintenance vehicles, two double-ended pocket tracks would be located on the Livermore Line, one just east of the Castro Valley Station and another east of the gravel pits along Stanley Boulevard.

Support Facilities

An end of line car storage yard is required for overnight storage of vehicles used in the shuttle operation, to provide the capability to adjust online train requirements according to the service criteria, and to provide for light maintenance and cleaning of vehicles. The yard should have a storage capacity of 120 vehicles.

Other yard requirements include:

Unscheduled repair vehicle shop (50 feet by 100 feet).

Maintenance of way shop (100 feet by 150 feet) for track and structure, electrical, and electronic field maintenance personnel.

A transportation facility (30 feet by 100 feet) to include a yard control tower, line control center, and transportation personnel office and locker space.

Turntable for "A" car reversal.

Wash track and machinery for exterior car washing.

The Livermore Yard would occupy part of the triangle of land between the Western Pacific, the Southern Pacific, and Vasco Road. This currently undeveloped land is planned for heavy industrial use. The railroad tracks on two sides of the parcel cut it off from access to the north, west, and south, severely reducing its development potential. A BART yard on this site would have minimum adverse impact on the environment and on the community of Livermore.

As shown on the Livermore Yard schematic plan, the yard lead tracks would form a continuation of the main line east of the East Livermore Station. The yard lead would then pass over the relocated Western Pacific drill track, and the Southern Pacific main line to enter the yard site. The transmission pylon just east of the Southern Pacific overcrossing may need to be relocated. All structures and facilities requiring access to Vasco Road are planned along the north side. The preliminary track layout, based on BART track specifications, would have a 750 foot transfer zone on all four transfer tracks. The triangular site would permit location of a bus storage and maintenance facility for the feeder bus system.

If BART is extended north, additional lead tracks could be constructed from the west end of the yard. If the extension were south or east, the yard could become double-ended by the construction of a new ladder track and leads at the east end of the yard.

Livermore Yard Schematic Site Plan

SERVICE SCHEDULES

The scheduled running time between terminals (East Livermore to Bay Fair) would be 26 minutes for the 24 mile run. Based on 1990 RTTPP patronage forecasts and the characteristics of the selected route, the service schedule shown in Table 12 was established. Train headways are based on planned service on BART's existing lines, and train sizes were determined by analysis of the patronage forecasts.

BART would be in operation seven days a week from 5:00 AM to 1:00 AM. On weekdays, peak hour trains would run every six minutes, with off peak service every twelve minutes until 10:00 PM. Weekends and holidays trains would run every 15 minutes until 10:00 PM. After 10:00 PM, service would be reduced to 20 minutes. During weekday peak hours, train sizes would average eight cars. Within the peak hour, train sizes would vary between six and ten cars, ten cars being required to handle the middle half hour peak.

During the morning and evening commute hours, shorter trains would be overcrowded. For this reason, the suggestion of having shorter platforms, say 520 feet for six-car trains or 660 feet for eight-car trains, in order to reduce capital costs was rejected. Peak hour seating capacity would be 5,760 passengers, with each train providing from 432 to 720 seats depending on the number of cars, well within the requirements of the RTTPP 1990 work trip patronage forecast. Relatively low demand during off peak hours, weekends, and holidays would allow train size to be reduced to two or three cars.

This service schedule would generate approximately 40,000 train hours per year and 8,800,000 car miles. Modifications could be made easily to respond to changes in local transit demand because with the Bay Fair transfer, the service schedule is not dictated by train headways on the existing system.

TABLE 13. ROLLING STOCK REQUIREMENTS, 1990

	Regular Service	Spares	Total
"A" Cars	20	3	23
"B" Cars	60	6	66
TOTAL	80	9	89

Source: BART

TABLE 12. LIVERMORE-PLEASANTON BART EXTENSION SERVICE SCHEDULE, 1990

Weekdays	Trains Per Hour	Headways (Minutes)	Cars Per Train
5 AM - 7 AM	5	12	3
7 AM - 9 AM	10	6	6-10[a]
9 AM - 4 PM	5	12	3
4 PM - 7 PM	10	6	6-10[a]
7 PM - 10 PM	5	12	2
10 PM - 1 AM	3	20	2
Saturday			
5 AM - 10 PM	4	15	3
10 PM - 1 AM	3	20	2
Sunday & Holidays			
5 AM - 10 PM	4	15	2
10 PM - 1 AM	3	20	2

(a) Actual peak hour train size is 6-6-6-10-10-10-10-10-6-6.

Source: De Leuw, Cather & Company; BART

ROLLING STOCK

BART cars on the Livermore-Pleasanton Extension would be identical with those presently being used by BART. The number of vehicles is determined by peak hour demand when both the number of trains and train size are at a maximum. BART trains would be composed of two to ten cars, depending on the service requirements. Each train is composed of two BART end cars with attendant cab and train controls, called "A" cars, and from none to eight interior cars, termed "B" cars. For normal operation of the extension, 20 "A" cars and 60 "B" cars would be required. In addition, three "A" cars and six "B" cars would be needed as replacement vehicles for use when regular service vehicles undergo routine maintenance. Table 13 summarizes the anticipated 1990 rolling stock requirements.

COSTS AND REVENUES

Capital Cost

The total capital cost of the selected BART line is estimated to be $370 million (1974 dollars). Two thirds of the total is construction cost, a category that includes BART line and station construction costs, BART-related public improvements, support facilities, and start-up costs. The $15 million that must be invested in major public improvements necessary for the BART extension, discussed in detail in the Implementation chapter, could be offset in part by funds from the California Railroad Grade Crossing Elimination Fund. Acquisition of right of way will require an additional $25 million, and rolling stock will cost $36 million. The capital costs are summarized in Table 14, while the sections that follow explain the approach used to calculate these costs.

Construction Cost — Construction cost estimates include the cost of building the selected BART alignment and necessary BART-related public improvements, such as railroad relocations. BART line construction cost estimates are based upon plan and profile data developed for the selected alignment. Unit costs for each type of construction (at grade, aerial, and subway) were developed using BART, San Francisco Muni-Metro, Washington Metro, and other appropriate contract data updated, where necessary, to reflect mid-1974 dollars. Costs for stations are based upon comparison with similar facilities on BART. No detailed engineering plans were prepared. Cost of support facilities, yards and shops, communication and train control, electrification, administration, engineering and management, are based on BART contract data converted to a per mile basis and updated to reflect mid-1974 construction costs. A contingency allowance of 25 percent was added to reflect the preliminary nature of the design. Related public improvement costs were estimated on an individual project basis.

TABLE 14. CAPITAL COST OF THE SELECTED BART EXTENSION (1974 Dollars)

Right of Way[a]	$ 25,700,000
BART Line Construction[a]	106,700,000
Station Construction	33,300,000
Pleasanton Railroad Consolidation	8,000,000
Livermore Railroad Consolidation (Phase II plus Trevarno Road and Mines Road grade separation)	7,000,000
Support Facility Costs[b]	89,000,000
Rolling Stock	36,000,000
Start-Up Costs	1,400,000
TOTAL	$307,100,000
Contingency	61,400,000
TOTAL	$368,500,000

(a) Includes allowance of $9 million for right of way and $11 million for line construction as reimbursement to CALTRANS for BART use of I-580 median and includes $8 million for relocation of Western Pacific main line east of Pleasanton.
(b) Includes the cost of BART yards and shops, electrification, communication and train control, and engineering and management costs.

Source: De Leuw, Cather & Company

Right of Way Cost — Right of way costs were estimated by BART Real Estate Department staff based on requirements established by the consultant. In the case of partial acquisition, it generally was assumed that severance damages would come close to or exceed the cost of complete acquisition. Therefore, the cost estimates and disruption estimates assumed full purchase in almost all cases. Although BART would be able to sell excess right of way, these gains were not considered in the analysis.

Both the right of way cost and the line construction cost include an estimate of the "buy-in" cost that BART would have to pay CALTRANS for an 80-foot median instead of a normal 32-foot freeway median. The exact amount that BART must pay will be subject to negotiation at the time of the purchase. Both the Federal-Aid Highway Act and the California Streets and Highways Code will permit CALTRANS to transfer the I-580 median right of way to BART without cost, but this factor was not taken into account in the cost estimate because the final decision rests with the State Highway Commission, not BART. In other areas of joint use such as along flood control channels, freeways, and railroad rights of way, costs assume that the necessary land would be purchased at fair market value.

Rolling Stock Cost — The cost estimate for the rolling stock is based upon the cost for BART cars indicated in the 1973 contract award to Rohr. Under that contract, "A" cars cost $449,000 each and "B" cars $396,000 each.

Start-Up Cost — BART staff estimates that it will cost approximately $1.4 million for testing prior to full service revenue operations. Included in this cost are pre-service runs and training of new personnel who will operate the line.

Operating Costs and Revenues

BART staff estimates that with a projected 1990 daily patronage of 36,300 passenger trips (10.9 million annual) it would cost $7.5 million per year (1974 dollars) or $0.69 per passenger trip to operate the Livermore BART extension (see Table 15). In making the operating cost estimate, BART staff assumed that the Livermore extension would operate as a shuttle service to the BART trunk line and that the extension would be operated according to present BART criteria and policies. The present BART system was used as a reference, and BART's experience with system maintenance and train operations provided the basis for estimating expenses. Given these assumptions, about 90 people will be required to handle line operations, 185 for maintenance, and 20 for police services and revenue collection, for a total staff of 295.

TABLE 15. 1990 PATRONAGE, OPERATING COSTS, AND REVENUES OF THE SELECTED BART EXTENSION (1974 Dollars)

Total Passenger Trips	
Daily	36,300
Annual	10,900,000
1990 Operating Costs[a]	
Annual	$7,500,000
Per Passenger Trip	$0.69
1990 Revenue Estimate[a]	
Annual	$6,400,000
Per Passenger Trip	$0.59
Projected 1990 Deficit[a]	
Annual	$1,100,000
Per Passenger Trip	$0.10

(a) For extension portion of trip only.

Source: BART

Assuming the current BART fare structure of $0.30 plus $0.03 per mile over six miles, to a maximum of $1.25, the revenue for the BART rail extension to Livermore would be $6.4 million per year, or $0.59 per passenger trip. Consequently, the BART rail extension will be operating at a deficit of about $1,100,000 per year or $0.10 per passenger trip. Both the revenue and the operating cost estimates are for the extension portion of the trip only.

COMPATIBILITY WITH TRANSIT SERVICE IN OTHER CORRIDORS

The selected BART route and stations are compatible with bus transit service in the San Ramon Valley and Niles Canyon/Mission Pass corridors. The Dublin-Northwest Pleasanton Station and the Pleasanton Station are logical transfer points between BART and corridor bus service, offering easy access to the freeways and adequate internal circulation. Studies of the compatibility with possible future rail extensions in the other corridors were based on sketch plans and connection configurations. The only major problem with a future rail extension would occur at the Dublin-Northwest Pleasanton Station where a transfer connection to a future San Ramon BART line would not be feasible. However, with construction of a new station on the selected BART route between Bernal Avenue and West Las Positas Boulevard, transfers could be made easily between the Dublin Canyon Line and a San Ramon BART Line. Consequently, this drawback was not viewed as critical.

The mechanics of coordinating bus service in the other corridors and local feeder service with the selected BART route are discussed in the Implementation chapter.

ENVIRONMENTAL IMPACT OF SELECTED BART ROUTE

The final decision on a BART extension to Livermore-Pleasanton must consider social, economic, and environmental impacts as well as capital and operating costs and traveler benefits. The National Environmental Policy Act and the California Environmental Quality Act require full evaluation of environmental impacts, particularly those that cannot be reduced or avoided, as part of the decision-making process. In this way, officials and the public at large will know what environmental values might have to be sacrificed in order to build a rail rapid transit extension to Livermore and Pleasanton. Early impact assessment often can lead to changes in design or location that will minimize adverse effects or increase potential benefits. Throughout the study, the process of predicting and evaluating impacts has permitted a progressive refinement of the design of the selected route. In the following sections, the impacts on the urban and natural environment will be described. For purposes of comparison with other alternatives, detailed evaluation tables presented in the Appendix summarize the impacts of the final alternatives. Reasons for rejecting alternative routes and stations are presented in the Alternatives chapter.

URBAN ENVIRONMENT

Disruption and Displacement

A total of 222 dwelling units are within the right of way of the selected route, 80 percent of which are single family houses. The greatest displacement would occur at the Castro Valley Station and along the route to Bay Fair Station where about 560 people living in 189 housing units would have to move to accommodate BART.

In the Valley, far less displacement would occur. Except for 2 single family residences that would have to be acquired along the line segment between the Dublin-Northwest Pleasanton Station and I-580, the major displacement would occur at the West Livermore Station. To accommodate BART in Livermore, 29 single family residences and 2 multi-family units housing 130 people would be acquired. A total of 15 businesses employing about 115 people also would be displaced by the selected Livermore-Pleasanton BART extension. Five of the businesses and 48 of the employees would be displaced by the Castro Valley Station and the Bay Fair connection, while the remaining business displacement would occur in Livermore.

The 1970 socio-economic characteristics of the station area 1,500 foot impact zones summarized in Table 16, provide a basis for evaluating the potential inequities that might be created by a BART station where there is existing development. Around the Castro Valley Station renters representing close to 40 percent of the station area population over the long run might have to pay more than the 1970 average of $138 per month, inflation aside, because of the improved access to the BART system that a local station would provide. Private redevelopment also could force them to move, a possibility that is analyzed further in the section on Corridor and Valley Development Impact.

Valley residents living in low value rental housing around the Pleasanton Station could be adversely affected by BART if their rents went up to reflect improved accessibility. However, large increases are not likely because new residents and potential BART riders able to pay more would want newer or larger units. The existence of developable land around the Pleasanton Station also would tend to minimize the economic effects of BART on housing costs. The West Livermore Station's impact zone exhibits the greatest proportion of homeowners and the smallest percentage of elderly, indicating the greatest walk-in potential of Valley stations with surrounding development. These potential BART riders are more able to absorb housing cost increases than residents around the Castro Valley and Pleasanton Stations.

Because BART's impact on housing costs could not be quantified, the evaluation process emphasized the relative difference among the alternatives rather than a specific level of cost increase that would occur with any given alternative. The selected route and stations were judged to be superior to the other alternatives in terms of potential inequities BART might cause. However, specific measures of increased travel cost for Valley employees displaced by housing cost increases or increased travel by reason of neighborhood separation were not developed.

Noise

To evaluate BART's noise impact, field measurements of BART noise made by Wilson Ihrig and Associates for BART and by the City of Albany were incorporated into graphs of noise contours showing the mean maximum sound level of 8 to 10 car BART trains in actual operation on each type of structure in relation to distance from BART tracks.

TABLE 16. SOCIO-ECONOMIC CHARACTERISTICS OF STATION AREA 1,500 FOOT IMPACT ZONES, 1970

	Population		Owner Occupied Housing Units		Renter Occupied Housing Units		
Station	Number	Percent Over 62 Years	Number	Average Value	Number	Average Rent Per Month	Percent of Units
Castro Valley[a]	3,779	10.3	808	$24,700	541	$138	40
Pleasanton	236	13	29	19,700	62	114	68
West Livermore	1,932	3.5	334	19,132	114	147	25

Source: U.S. Census

Note: There were no housing units in Dublin-Northwest Pleasanton or East Livermore Station areas in 1970.

(a) Site assumed for cost estimating and impact analysis, further studies are recommended.

Using noise standards developed by the National Cooperative Highway Research Program, the extent of exposure of existing and projected 1990 land uses to moderate noise impact (0 to 5 dbA above the standard) and major noise impact (over 5 dbA above) was computed. The standards are 75 dbA for commercial land use, 70 dbA for parks and schools, and 65 dbA for residential land use. Without sound barriers, housing within 600 feet of the BART line (aerial structure) would be exposed to major train noise impact, and housing lying between 600 and 1,100 feet would be in a moderate noise impact zone. With barriers such as have been installed near the North Berkeley Station, BART noise can be reduced, but even then housing within 300 feet would be exposed to moderate impact and housing within 125 feet would suffer major impact.

Assuming that barriers would be built along at grade and aerial sections of the BART route to reduce noise in developed areas, over 25,000 feet of BART line would expose adjacent projected 1990 land uses to major impact, and 7,000 feet of line would create moderate noise impact. Without noise barriers, over 50,000 feet of line would expose adjacent land uses to major noise impacts, double the amount projected with noise barriers. The noise impact of the selected BART route is summarized in Table 17.

TABLE 17. NOISE IMPACT ASSESSMENT OF THE SELECTED BART EXTENSION

	Existing 1972 Land Use[a]		Projected 1990 Land Use[a]	
	Moderate Impact 0-5 dbA	Major Impact Over 5 dbA	Moderate Impact 0-5 dbA	Major Impact Over 5 dbA
With sound barriers	1,300	10,000	7,000	25,700
Without sound barriers	8,500	25,000	7,000	52,500

(a) Lineal feet of land use adjacent to alignment.

Source: Livingston and Blayney

Visual and Physical Fit: Urban Design Potential

Because BART would be built within existing transportation corridors, the selected line would not intrude significantly into the urban environment nor block views or mar the scenic quality of Dublin Canyon and the Valley. Where BART would be on aerial structure, riders would have stimulating views of the Valley, making the ride more enjoyable. Around Stoneridge Drive and south of Bernal Avenue, BART's aerial structure would be intrusive, and consequently nearby residents and employees might consider it out of scale and unattractive. When BART is at grade within the I-580 median or alongside I-680, its low profile would not detract from freeway views, especially vistas of the hills and the Valley floor. Along Stanley Boulevard between Livermore and Pleasanton and within Livermore, the railroads already intrude, so BART's incremental impact on the visual quality of this transportation corridor is slight. The planned landscaping and the use of berms through Livermore would reduce overall noise and improve the visual impact of all three rail facilities. Placing BART in subway through Livermore would avoid the adverse impact of a third set of tracks and wider right of way but would not guarantee adequate treatment to reduce the visual impact of the present railroads.

Size alone makes BART stations major visual elements in the urban environment. Parking areas filled during working hours and nearly empty the rest of the time, can be made less unattractive by trees and by design that relieves the monotony of the space with landscaped dividers. As the station plans indicate, access streets, the BART line, and the railroads often would act as visual buffers, isolating the station from its surroundings. The greatest visual impact would occur at the Castro Valley Station where residents on three sides would look out upon the BART station and parking lot across local streets. In the Valley, planned residential development within the 1,500 foot impact zones of the Dublin-Northwest Pleasanton and Pleasanton Stations could be designed to orient living areas away from the BART station, thereby minimizing the potential adverse impact.

Growth-inducing Impact

A BART extension would induce growth as a function of real or perceived improvements in job accessibility from the Valley. For some potential residents, BART would dispel an image of the Valley as a remote hinterland, while others would assume better accessibility because a choice of mode would be available or because "others" would use BART, relieving freeway congestion. In theory, a sophisticated regional land use model such as ABAG's PLUM model should be able to combine socio-economic data and accessibility measures and predict the growth-inducing impact of BART, but this could not be accomplished during the study. The only reliable measure available is the future capacity of I-580 freeway. A second approach based on assumptions about the share of projected BART riders who would move to the Valley because of the presence of BART can give only a "feel" for the probable share of BART patronage represented by persons who moved to the Valley because of BART. These measures set the upper and lower limits of a range within which BART's growth-inducing impact probably would lie.

CALTRANS projects 1995 traffic on I-580 through Dublin Canyon at 90,000 vehicles per day with no transit service and with a Valley population of 185,000 (Alameda County portion). The approved eight-lane freeway easily could accommodate this volume, so in terms of this analysis BART's growth-inducing impact resulting from reduction of freeway congestion probably is imperceptible. Travel speeds, for example, are projected to increase no more than two miles per hour with BART, according to CALTRANS' analysis for the I-580 Environmental Impact Statement, Air Quality Report, Second Supplement.

At the other end of the spectrum, a maximum reasonable upper limit of BART's growth-inducing impact can be gauged by determining the total population impact of an assumed share of BART commuters who otherwise might not live in the Valley. Of the 12,100 Valley out-commuters projected by RTTPP to be riding BART in 1990, probably no more than one in four would have lived elsewhere if BART were not extended. Because the supply of developable land, closer to employment centers is quite limited, the Valley will continue to urbanize even if BART is not extended. So, any share greater than one out of four out-commuters in all likelihood would include households that would have moved to Pleasanton and Livermore anyway. Using the projected 1990 labor force participation rate, the population growth attributable to these net new residents would be 8,640 persons. These new households require services and so would generate new employment at a rate of 0.47 jobs per employed resident (see Framework for Analysis chapter on employment assumptions). This indirect or multiplier effect would add 4,060 persons to the initial estimate of BART's population impact, taking into account the households supported by these new jobs. Consequently, the total population growth attributable to BART would be 12,700, 5.6 percent of the 1990 Valley population of 227,000 or 22 percent of the Valley growth between 1980 and 1990. If 50 percent of the Valley BART patrons are assumed to

be net new additions who would not have moved to the Valley if BART were not extended, then BART's contribution to 1990 Valley population would be 25,420, or 11.2 percent.

If I-580 were not reconstructed to eight lanes, a measure of BART's growth-inducing impact would be its ability to improve accessibility to the Valley. An MTC study based on the premise that access constraints are the principal deterrent to Valley growth concluded that a BART extension could increase the Valley's 1990 population by 20,000. However, congestion on the main access route has not stopped growth in Marin County, Contra Costa County, or San Mateo County due to commuters' willingness to accept congested conditions and to new jobs created within each county.

Because growth-inducing impacts are the most elusive and difficult to estimate of all BART impacts, no single number was derived to represent the net population increase attributable to BART. Instead, the CALTRANS projection indicating an almost imperceptible increase in population was used as a baseline, and all other impact assessments were geared to the 1990 population, economic development, and travel patterns summarized in the Framework for Analysis chapter. However, if BART were to increase 1990 population by as much as 20-25,000, the upper limit believed reasonable, then population and employment related impacts would have to be modified. In most instances, the environmental gains attributable to BART would be reduced by 9-11 percent. Given the uncertainty in forecasting population, employment, patronage and other impacts, the net effect of this "worst case", probably is not significant. For this reason, a range of impacts is not indicated for each subject area.

In the MTC BART Impact Program currently underway, the effects of the existing BART system on land use and urban development in the Bay Area since 1962 are being analyzed using a variety of research techniques. The results of this effort, expected to be completed in 1977, will provide the necessary empirical base for more precise estimates of potential growth-inducing impacts of future extensions.

If I-580 were not reconstructed to eight lanes, a measure of BART's growth-inducing impact would be its ability to improve accessibility to the Valley. An MTC study based on the premise that access constraints are the principal deterrent to Valley growth concluded that a BART extension could increase the Valley's 1990 population by 20,000. However, congestion on the main access route has not stopped growth in Marin County, Contra Costa County, or San Mateo County.

Regional Development Impact

A Dublin Canyon corridor BART line would have more growth impact on the Valley than the other corridors studied because it would provide the greatest improvement in accessibility to San Francisco and Oakland. The case for the San Ramon corridor rested on the hypothesis that the Valley's employment orientation could be shifted to Walnut Creek and the percentage of commuter travel to Oakland and San Francisco could be reduced. Employment gains in Walnut Creek would have to be at the expense of Oakland and, possibly, San Francisco, assuming total regional employment growth would be unaffected by a decision to build a BART extension to the Valley.

A Dublin Canyon corridor could have a positive effect on Oakland employment by improving access from a large supply of new housing attractive to those seeking a homogenous suburban social environment.

Regional commercial retail and office development is unlikely to be affected by a decision to extend BART to the Valley. Around Bay Fair, few opportunities exist that would attract developers because the area is not competitive with downtown Hayward as an office location. Only through massive publicly-assisted redevelopment would there be a significant impact in the Bay Fair Station area.

Corridor and Valley Development Impact

The major development impact in the Dublin Canyon corridor and in the Valley would be likely to occur around BART stations where new housing would be built for BART commuters. While all of the station sites have some potential for BART-oriented development, only three of the five have opportunities for additional housing. At the Dublin-Northwest Pleasanton Station the regional shopping center development plan shown on the station schematic site plan effectively pre-empts the developable acreage, leaving little space for additional BART-oriented activities. At the East Livermore Station industry is the planned use for the surrounding vacant land. The two railroads make the area unattractive for residential development, except on the outskirts of the 1,500 foot impact zone where noise levels are lowest.

Potential for BART-oriented residential development around the Castro Valley Station and the West Livermore Station exists because the low density housing conceivably could be replaced at higher densities. Vacant land around the Pleasanton Station could be

used for residential development. At the Castro Valley Station about 40 acres (half of the land occupied by single family houses) might be redeveloped for apartments at a density of 20-25 units per acre, resulting in 880 units for 2,000 persons, but high land costs and assembly difficulties could limit redevelopment over the near term. At the Pleasanton and West Livermore stations, townhouses or other housing designed for families would meet the needs of BART-oriented commuters more effectively than conventional apartments. About 940 townhouses could be built around each of these Valley stations at a density of 10-15 units per acre, providing housing for 5,250 additional people within walking distance of BART (2,625 per station). At the Pleasanton Station, it is assumed that 90 percent of the now planned industrial acreage within the 1,500 foot zone could be used for residential development, while at the West Livermore Station about three-quarters of the single family housing north of the railroad tracks could be redeveloped for BART-oriented housing. In all three areas, land also might be acquired for open space and neighborhood parks as well as for buffer zones between BART parking lots and residential areas. If all of this BART-oriented development occured within the three station areas, 2,760 housing units for 7,250 people would be built, increasing the total housing within walking distance to 7,170 units.

Castro Valley is projected by the Alameda County Planning Department to be built to holding capacity by 1990, so high density development near a BART station would increase the population total and would not result in retention of open space. If high density housing were not built near the Valley BART stations, the same number of units probably would be built elsewhere in the Valley at lower density. Assuming an average density of five units per acre, 300 acres would be saved by the higher density development near BART. This saving would accrue only if the full potential for BART-oriented residential development were realized and if BART did not induce sufficient new growth to cancel the open space gain.

An increase in local expenditures might be an indirect economic effect of a BART extension, assuming people spend a portion of any travel cost savings in local retail and service establishments. However, no evidence exists to indicate how much of the $23 million that Valley BART patrons would save annually, assuming they did not have to drive to Bay Fair Station, would be reflected in increased retail sales in the Valley. As the MTC studies of the impact of the existing BART system on retail sales are completed, more accurate estimates will be available to gauge this potential economic benefit.

BART probably would not have an impact on overall levels of employment in Castro Valley or in Dublin, Pleasanton, and Livermore. It is unlikely that Valley businesses would lose sales to outside retail centers because of BART. The proportion of shopping trips that potentially could be diverted to BART based on comparable experience elsewhere was estimated to be about 3 percent of total shopping trips at major retail centers, hence BART's impact would be minimal.

Historical and Archaeological Sites

No known historical or archaeological site would be directly threatened by construction of the selected BART route primarily because the alignment lies almost exclusively within existing public rights of way. No public open space or recreation area lies within the proposed BART right of way, consequently detailed analysis of alternatives as required by Section 4(f) of the federal Department of Transportation Act is not necessary. Under the federal Archaeological Conservation Law, funds would be available for salvage operations during the construction period if further studies indicate the existence of archaeological sites along the proposed BART route.

Local Government Costs

BART's principal impact on local government costs will occur because local governments' share of the expense of the railroad relocation and grade separation projects in Pleasanton and Livermore would be assumed by BART, not by the cities. Consequently, local governments could "save" $1.5 million, their normal share of the $15 million total cost, assuming that they would have gone ahead with these railroad consolidation projects at some future date whether or not BART were extended.

To the extent that BART would foster compact development around stations and the potential land "saving" described in the preceding section were realized, local government costs would be lower than if low density development continued. The amount of "savings" from 300 acres of open space that otherwise would have been developed cannot be determined precisely without a detailed cost/revenue study. Similarly, the reduction in street maintenance costs because a certain proportion of trips were diverted to BART cannot be forecast with any reasonable accuracy without a better understanding of BART's impact on local travel patterns. The RTTPP model did not make forecasts of mode of access to BART for use in estimating changes in local trip patterns. The assumptions about access mode which are based on

comparable stations on the existing BART system are not precise enough to indicate whether there would be any savings in local government costs for street maintenance.

Compatibility with Local General Plans

The selected route and anticipated station area development would be compatible with presently adopted county and city general plans. The Composite General Plans, 1990 map (see summary inside back cover) indicates the planned land uses in the corridor and the Valley. None of the uses shown on the station schematics conflicts with the proposed uses. In fact, the choice of the southern route through the Valley will reinforce the existing communities and strengthen planning and development in the down town areas of Pleasanton and Livermore.

NATURAL ENVIRONMENT

Geologic Factors

In the Valley, 13,800 feet of BART line would be exposed to geologic hazards. Close to half of this would be on aerial structure, judged by the engineering geologists to pose the greatest hazard of the three structure types because the structure could collapse. In addition, 15,500 feet of line would lie over expansive soils that require special design and construction measures, and 200 feet of line would have to contend with possible high water tables. These last two factors are not serious environmental constraints, but they would increase construction costs. Between Livermore and Pleasanton, the high water table and near vertical cut slopes on the south side of Stanley Boulevard would exacerbate the problem of liquefaction of the unconsolidated sandy gravel and saturated sand during an earthquake on either the Calveras or San Andraes faults. A possible design measure to minimize this hazard would be to use a backfill buttress south of Stanley Boulevard to prevent slippage of the entire "dike" upon which BART would be built.

Water Resources and Flood Hazard

The selected BART route would have no direct adverse impact on surface and ground water resources in the Valley or in the corridor. Indirectly, BART could have a beneficial effect to the extent that compact development is encouraged and the recharge capability of presently undeveloped lands is not impaired.

The existing and proposed flood control improvements in the Valley also would be unaffected by BART construction. Along I-680, BART's joint use of the flood control right of way would not impair the function of the flood control channel. Elsewhere in the Valley, BART construction would have no impact on local drainage patterns. I-580 reconstruction impacts would not be attributable to BART.

Ecological Resources

Construction of the selected BART line would have little or no direct impact on the plant and animal wildlife resources of the Valley. In the Dublin Canyon corridor, any adverse impacts resulting from reconstruction of I-580 could not be charged against BART because the freeway will be rebuilt whether BART is extended or not.

Air Quality

Air pollution in the Valley primarily is the result of high photochemical oxidant or smog concentrations. The automobile is the principal source of air polluting emissions of hydrocarbons and nitrogen oxides which are transformed into oxidant upon exposure to sunlight. The frequency of inversion layers in the Valley limits the airshed's ability to disperse these pollutants. Current studies by the City of Livermore, Arthur D. Little, and CALTRANS indicate that as much as 50 percent of the air pollution in the Valley may be imported from elsewhere in the San Francisco Bay air basin. Because oxidant is an air basin-wide problem, local efforts will not be sufficient to eliminate air pollution unless they are matched by efforts in the remainder of the air basin to reduce emissions of hydrocarbons and oxides of nitrogen.

It often is contended that population and economic growth should not be permitted if it would interfere with the achievement and maintenance of adopted federal and state air quality goals. To implement the federal Clean Air Act, a Transportation Control Plan has been developed for the San Francisco Bay Air Basin by the Environmental Protection Agency, and an air quality maintenance plan is being prepared by the California Air Resources Board. Using a linear proportional "roll back" model, the Environmental Protection Agency calculated that motor vehicle emissions in the air basin would have to be reduced by 78 percent from 1970 levels in order for the oxidant standard to be met.

Motor vehicle emission control devices on new cars will account for a major share of the required reduction, but vehicle miles of travel also will have to drop in order to meet the prescribed emissions levels. The limitation of the "roll back" approach to air quality planning is that local air quality and its relation to local emissions are not taken into account. If this were done, conceivably emissions reduction targets might vary from area to area within the San Francisco air basin, and only a few communities would be required to meet the 78 percent goal. Other communities might be given targets of 60 percent or 70 percent. This selective application of air quality strategies will be possible when sophisticated models of the flow and chemical transformation of air pollutants have been validated and are available for land use and transportation planning impact assessment.

Air Quality Models - Over the past few years, the state of the art of forecasting levels of pollution has advanced rapidly, and more advances are expected in the coming years. However, no models currently available can predict accurately regional and local impacts of BART and growth on ambient concentrations of photochemical oxidants. The Bay Area Air Pollution Control District, the Lawrence Radiation Laboratory, and the Ames Research Center are using a National Science Foundation Grant to study how growth in the Bay Area will affect air quality. Their computer simulation model, while not expected to be complete until 1976, will make it possible to determine the constraints air quality should place on Valley growth if the standards of the Clean Air Act are to be achieved and maintained. At MTC the DIFKIN photochemical air quality model is being improved and will be available for air quality impact assessment in 1976.

BART's Impact on Emissions — In the absence of a comprehensive air quality/land use and transportation simulation model, the next best method for forecasting the impact of BART on air quality is to determine BART's effect on vehicle miles of travel. The potential reduction in future emissions then can be calculated, taking into account the effect of speed of travel on vehicle emissions. Ideally, RTTPP would have produced accurate estimates of vehicle miles of travel in the Valley and the Dublin Canyon corridor with and without a BART extension. However, the same population and employment levels were not used for the various alternatives being tested by the Task III model, and through traffic was not taken into account. CALTRANS, in preparing its Air Quality Impact Report Second Supplement for the I-580 Environmental Impact Statement, projected 1990 vehicle miles of travel (VMT) and emissions for the Alameda County portion of the Valley and the Dublin Canyon corridor with I-580 reconstructed to eight lanes with transit and without transit. The level of transit ridership assumed, however, was quite low, 20 percent of peak period travel versus RTTPP's 40 percent for peak period work trips. Consequently, the 3 percent reduction in VMT and emissions that CALTRANS forecast might be considered low in light of the RTTPP projections.

For purposes of comparison, the CALTRANS projection of 3,557,000 vehicle miles of travel (VMT) without BART will be used to represent the 1990 base case. If the 34,000 BART patrons drove to Bay Fair Station instead of riding BART, their average trip would be about 17 miles using the Valley BART stations as starting points. Because the home to BART station trip is the same for both alternatives, it is not included. If BART were not extended, daily vehicle travel (assuming 1.2 passengers per vehicle) would increase by 482,000 miles, assuming for the moment that BART would have no impact on total travel. The BART staff analysis of trip productions for RTTPP tests indicates that this assumption is borne out by the various model tests and that the amount of out-commuting is not influenced by availability of alternative modes, although in-commuting does increase slightly with BART. If BART has no impact on total travel, the 1990 VMT for the Valley and Dublin Canyon with a BART extension would be about 14 percent below the CALTRANS forecast. Using California Air Resources Board 1990 emissions factors corrected for speed of travel, the reduction in hydrocarbon emissions would be 0.42 tons per day, or 12 percent of CALTRANS hydrocarbon emission forecast for the base case — an eight lane freeway through Dublin Canyon without transit. This improvement is superior to the original CALTRANS estimate of 3 percent reduction, primarily because of the higher patronage expected on the BART extension. The reductions in emissions of carbon monoxide and oxides of nitrogen would be proportional to those indicated for hydrocarbons. BART's impact on vehicle miles of travel and hydrocarbon emissions is summarized in Table 18.

TABLE 18. VALLEY AIR QUALITY ANALYSIS, 1990

	With a BART Extension	Without a BART Extension
Daily Vehicle Miles of Travel	3,075,000[a]	3,557,000[b]
Daily Hydrocarbons Emissions (tons)	2.98[a]	3.40[b]

Source: (a) CALTRANS I-580 Air Quality Impact Report, Second Supplement
(b) Livingston and Blayney

In the future, an increasingly important factor in controlling air polluting emissions from motor vehicles will be reduction of "cold starts". As vehicle emission control devices reduce emissions to meet the Clean Air Act standards, it is expected that the period of greatest emissions will be during the time the engine is warming up, hence the term "cold starts". The ability of a transit system to reduce cold starts would be measured by the decrease in total trips as opposed to vehicle miles of travel. Only walk-in patrons and transit trips originating on a walk-to feeder bus line would count as reducing cold starts with this approach to air quality impact assessment. In 1990, daily feeder bus patronage in the Valley is projected to 10,900, while the total number of daily person trips in the Valley is 700,000. Translating these trips into vehicle trips and ignoring walk-in patronage which was not estimated, BART's reduction of "cold starts" would be 1.5 percent, about half the impact initially forecast by CALTRANS.

Several qualifications should be added to the analysis of BART's potential impact on air pollution. The accuracy of the estimate of reduction attributable to BART depends on the accuracy of the VMT forecasts and the population and employment estimates. If growth or total travel is greater than estimated, BART's contribution would be proportionally less. On the other hand, the mobile source emissions factors assume that the goal of 100 percent compliance would be met. The importance of BART in a comprehensive air resource management program would increase if efforts to reduce average emissions per vehicle mile are not as effective because each trip diverted to BART will result in greater emissions reductions.

BART's Impact on Air Quality — The potential reduction in emissions can be related to air quality standards with the mathematical model developed by Dr. Ralph A. Larson for the Environmental Protection Agency. This method assumes that the distribution of daily oxidant levels will follow a predictable (lognormal) distribution with the overall level determined by the emissions of reactive hydrocarbons in the airshed. With this approach, CALTRANS estimated that in 1990 the oxidant standard would be exceeded only two days a year in Dublin Canyon and the Valley with a reconstructed I-580 with or without transit. If a BART extension were to reduce hydrocarbon emissions by 14 percent as opposed to CALTRANS' estimate of 3 percent, then the oxidant standard in the Valley would not be exceeded in 1990 as long as BART did not increase CALTRANS' estimate of total travel and the 1990 population did not exceed 227,000 for the Livermore-Amador-San Ramon Valley (185,000 for the Alameda County portion alone). Accepting these premises, federal and State oxidant standards could be achieved by 1990 with BART.

MTC also has analyzed the impact of improved accessibility to the Livermore Valley and its effect on population growth and air quality using the RTTPP forecasts of VMT as representative of the base case — I-580 reconstructed to eight lanes with BART in the median. The VMT shown by the RTTPP model is 3,281,000, but through trips are not included in the RTTPP estimate. In 1995, through traffic, as forecast by CALTRANS, will be 23,500 vehicles per day. When these trips are added to the RTTPP highway volumes under the BART alternative (102,800 daily person-trips), highway travel through Dublin Canyon is projected to be about 131,000 person-trips

(110,000 vehicle trips) per day with BART. If the 31,400 Valley BART patrons drove their cars to Bay Fair, an additional 26,200 vehicles would travel through the Dublin Canyon corridor on I-580, and total 1990 daily travel through Dublin Canyon would be 136,200 vehicle trips. For the I-580 EIS, Air Quality Impact Report Second Supplement, CALTRANS estimates Dublin Canyon freeway travel to be 75,800 daily vehicle trips with a comparable Valley population and no rapid transit. The most recent CALTRANS 1995 forecast for Dublin Canyon shows 90,000 daily vehicle trips. The major discrepancy between RTTPP forecasts and the CALTRANS forecasts may be due to the structural differences between the computer simulation models (a land use-based trip generation model and a multi-modal behavioral model) and the population and employment forecasts, but this discrepancy could not be resolved in this study. Until this is done, it will not be possible to be reasonably certain whether BART would induce development and/or increase total travel to such an extent that it would increase total emissions, thereby interfering with efforts to achieve and maintain air quality standards.

Energy Requirements

A comparison of BART energy consumption with the energy demands of automobiles indicates how much energy would be saved at the projected 1990 patronage levels if BART did not increase total travel. For analysis purposes, only operating energy requirements will be examined because accurate information is not available on the energy used to build automobiles, trains, parking lots, and garages.

The 1973 study of BART energy consumption conducted by Professor Timothy J. Healy for CALTRANS utilized the best available data. For BART propulsion energy, he assumed a load factor of 25 percent, 18 passengers per vehicle, and an energy conversion rate of 10,000 British Thermal Units per kilowatt hour (BTU's per kwh) which corresponds to a power plant distribution system efficiency rate of 34 percent and estimated energy demand to range from 1,800-3,000 BTU's per passenger-mile. On the Livermore-Pleasanton BART extension, the projected 1990 load factor is closer to 50 percent, so the projected energy demand would be 900-1,500 BTU's per passenger-mile.

For the average Valley out-commute travel, automobiles consume between 8,000 and 9,000 BTU's per passenger-mile, assuming 35 miles per hour average speed, 13 miles per gallon, 1.2 passengers per vehicle, and 136,000 BTU's per gallon gasoline conversion rate. For every automobile trip diverted to BART, the average energy savings is about 7,400 BTU's per passenger-mile. Total energy saved daily if the 31,400 Valley BART patrons would have driven to Bay Fair, would be 3.95 billion BTU's or 696 equivalent barrels of oil. Annual energy savings would be close to 210,000 equivalent barrels of oil.

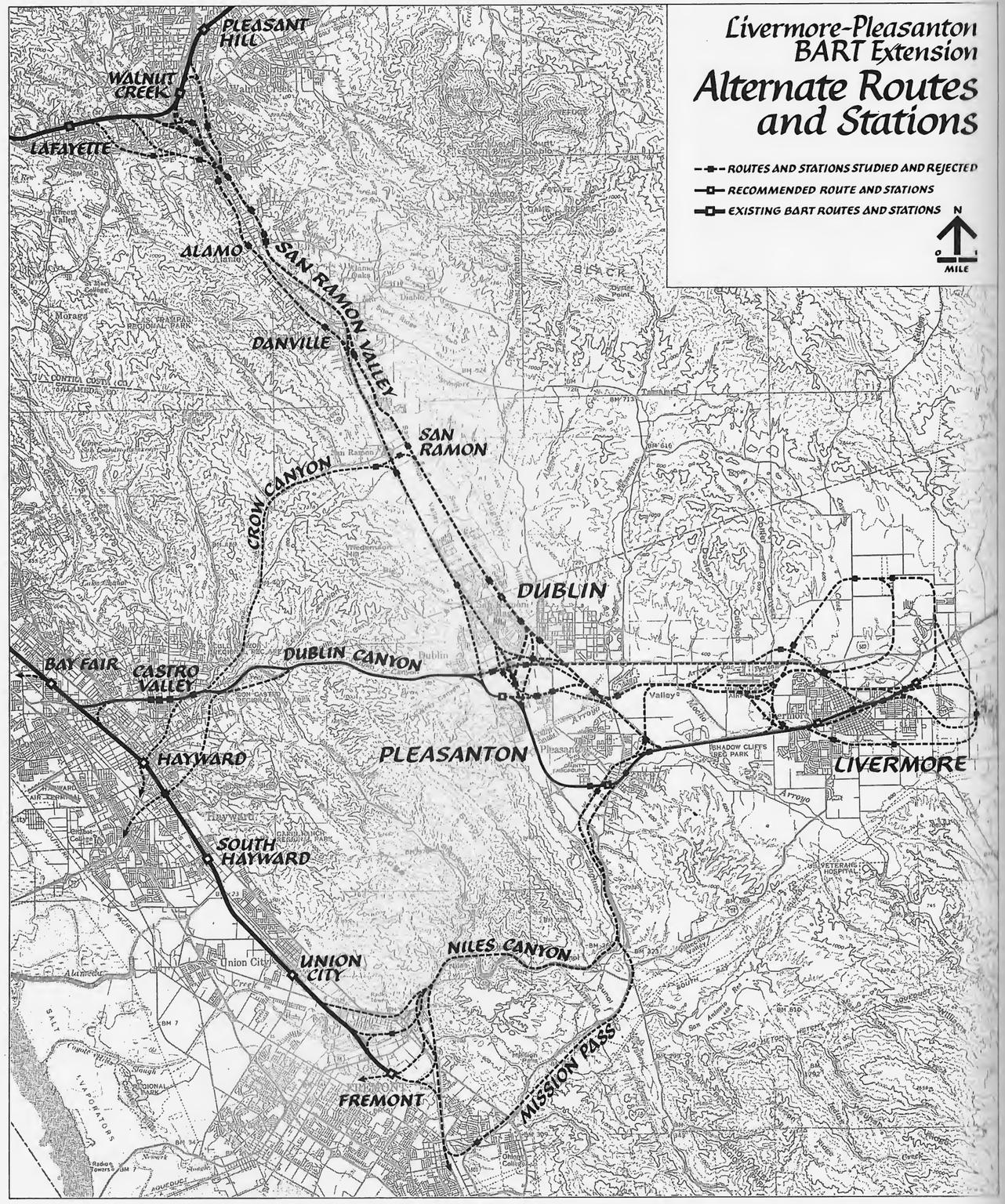
This estimate is on the conservative side because the energy saved by Valley in-commuters and intraValley trips was not taken into account, but it is exceedingly difficult to forecast the actual savings for these other trips. However, it is unlikely that these additional savings would exceed 20 percent of the total forecast for Valley out-commuters. This analysis also is quite sensitive to changes in vehicle occupancy, BART loadings, fuel consumption values, and BART's impact on total travel. Major changes in these variables could significantly alter the numbers, but the conclusion that BART is significantly more efficient than automobiles probably would not be affected. Even if automobiles were twice as efficient as they are today, BART still could save about 90,000 equivalent barrels of oil annually over the automobile.

Open Space

BART would have a positive impact on open space because it could foster development within established communities rather than at outlying locations. If all the potential development forecast in the Corridor and Valley Development Impact section were realized, about 300 acres of open space would not be urbanized. Agricultural lands, particularly the vineyards south and east of Livermore, might not be pre-empted by urban uses if local governments are successful in controlling urban expansion and promoting station area development. Specific techniques that might facilitate local development coordination with a BART extension are discussed in the Implementation chapter.

In Pleasanton, relocation of the Southern Pacific railroad tracks to the Western Pacific right of way would free that land for other uses. One possibility would be to expand the existing linear park along a portion of the right of way.

The selected BART route also would have a positive impact on recreation trail systems by offering additional opportunities for joint right of way use. Recreation trails for bicycling, hiking, and horseback riding running parallel to BART aerial structure could benefit from the enlarged right of way. With BART at grade, it would still be possible to have trails for bicycling or hiking alongside, but BART noise even with barriers probably would make horseback riding undesirable. Trail crossings could be designed into the system quite easily. Many creeks and arroyos could be developed with linear parks connecting to the Valley BART stations. In certain places, landscaping would restore natural scenic qualities that could enhance the recreation experience and improve the view for BART riders.


Livermore-Pleasanton
BART Extension
Alternate Routes
and Stations
ROUTES AND STATIONS STUDIED AND REJECTED
RECOMMENDED ROUTE AND STATIONS
EXISTING BART ROUTES AND STATIONS
N
0
1
MILE
PLEASANT HILL
WALNUT CREEK
LAFAYETTE
ALAMO
SAN RAMON VALLEY
DANVILLE
SAN RAMON
CROW CANYON
DUBLIN
DUBLIN CANYON
BAY FAIR
CASTRO VALLEY
HAYWARD
SOUTH HAYWARD
PLEASANTON
LIVERMORE
UNION CITY
NILES CANYON
FREMONT
MISSION PASS

BART ALTERNATIVES

During the course of the study, alternative routes and stations were examined in the corridors and in the Valley. The corridor studies focused on the best route to the Valley in terms of traveler benefits, regional development impacts, natural environmental impacts, and cost. In the Valley, station alternatives were generated and then links connecting these sites were located. The initial analysis examined Valley stations and routes independently, and then these were combined into lines connecting to the existing BART system. The last step in the evaluation of alternatives was the assessment of six BART lines. Evaluation of Valley alternatives considered traveler benefits, community impacts, natural environmental impacts, and costs. Many preliminary alternatives were rejected, and only the highest ranking alternatives were retained throughout the first four phases of the study. All of the routes and stations studied are shown on the Alternate Routes and Stations map.

CORRIDOR ALTERNATIVES

Five BART service corridors were evaluated: Dublin Canyon, San Ramon Valley, Niles Canyon, Mission Pass (I-680), and Crow Canyon. Within each corridor, alternate routes were examined in order to take into account all the opportunities and constraints. Joint use of railroad rights of way, for example, had to be weighed against joint use of the freeway median in the San Ramon Valley. Various ways of tying an extension into the existing BART system also were explored.

The following sections describe the major alternatives examined in the corridors and in the Valley, including reasons for early rejection of certain alternates. Evaluations of the final alternatives are summarized to show the principal differences among the corridors and the Valley routes and stations. For detailed analysis of each station and link on the six final alternatives, readers should refer to the Appendix.

Dublin Canyon

For purposes of evaluation, it was assumed that I-580 would be reconstructed to include space for the BART extension in the freeway median. Alternatives with an independent alignment for BART were studied by BART in 1970/71, so no further analysis was conducted by the consultant. (See Preliminary Route Study Dublin Canyon Corridor Along I-580, 1971.) Separate freeway and BART rights of way would greatly increase environmental disruption and the capital cost of an extension. A joint transportation corridor appears to be the logical solution, even if the freeway were to be narrower than the approved 196 foot shoulder to shoulder section.

Three possible connections to the Hayward BART station were examined, but they were subsequently rejected because of high cost, extreme disruption and displacement, and out of direction travel for most Valley patrons.

Castro Valley Station Alternates

Castro Valley Station alternates are described in the Selected BART Route chapter.

San Ramon Valley

Two existing transportation routes through the San Ramon Valley offer joint use opportunities for a BART extension that would minimize BART's impact on existing development and on the natural environment. BART could be built within the Southern Pacific right of way between Walnut Creek and Dublin. However, north of Danville, where the railroad right of way is only 50 feet, BART would have to be on aerial structure, and the right of way would have to be widened 20 feet. Alternatively, BART could be accommodated on aerial structure in the median of I-680. This option would be less disruptive than an extension located in the Southern Pacific right of way and, therefore, was retained for more refined study during evaluation of the final alternatives.

Within Walnut Creek, three BART lines extending to Dublin and the Valley were studied as final alternatives. One route would connect to the existing Walnut Creek Station from the northeast and would follow the Southern Pacific tracks south to Rudgear Road. A second route would run south from the Walnut Creek Station through downtown in a bored tunnel before entering the I-680 median, thereby offering the greatest potential for BART-oriented employment increases within walking distance of a downtown station. The third route would head south from the existing station along the freeway west of downtown before entering the freeway median. South of Walnut Creek, the best route would be in a widened I-680 freeway median to Danville and in the Southern Pacific right of way between Danville and Dublin. Alternatives involving direct line connections to Pleasant Hill and to Lafayette, bypassing the Walnut Creek Station were rejected early in the study because of out of direction travel, greater cost, lack of service to downtown Walnut Creek, and extreme disruption.

Four alternatives for accommodating BART along I-680 were studied: three using the freeway median and one at grade along the west side of the freeway. For evaluation of the final alternatives, it was assumed that BART would be at grade in an 80 foot median of a reconstructed eight-lane freeway primarily because this alternative had the lowest cost and shortest distance between the mezzanine and the station platform. To reduce right of way requirements, BART could be placed on aerial structure either in the 46 foot median of the existing six-lane freeway or in the 30 foot median of a reconstructed eight-lane freeway. The option to build at grade alongside the freeway would require a wider combined BART/freeway right of way than any of the other alternatives and would cause the most disruption.

South of Danville, BART would be located in the 100 foot wide Southern Pacific right of way. Through areas zoned for industry, BART would be on aerial structure to permit the Southern Pacific to offer potential shippers rail service on either side of the BART line. The remainder of the line would be at grade with short sections of aerial structure at street crossings. Alternatively, the line could be partially depressed at a cost premium of $2.5 million per mile, and streets would overpass the BART line at grade, reducing BART noise in residential neighborhoods.

Choice of the San Ramon corridor would have some influence on the distribution of jobs, but there would be substantial disbenefits for many BART riders. A BART connection to the Walnut Creek station could be expected to result in an increase of 1,900 jobs within walking distance of the station by 1990 (a 5 percent increase within the Walnut Creek General Plan area).

Development pressures in downtown Walnut Creek are expected to be strong with or without a BART extension. In spite of competition from Sun Valley Shopping Center, retailing in Walnut Creek remains healthy, and the addition of Bullock's in the central business district has increased its prestige. Lack of vacant land is not expected to curtail growth. Walnut Creek has been the location of new subregional office development, notably the high rise Fidelity Savings Building adjoining the BART station. The community's prestige and convenience to high quality residential areas, its access to the regional core via freeway and the present BART line, and its confined downtown area that will force compact development, all point toward a continuation of the trend. However, there is no reason to believe that a BART connection would divert more than one or two percent of San Francisco's potential regional office employment gain during the next 20 years. If a sizable shift is not a likely possibility, there is little reason to connect the Valley to another area that is expected to have a large net out-commute rather than directly to the areas that have a surplus of jobs over living space.

San Ramon Valley Station Alternatives

Nine of the 23 potential station sites in the San Ramon Valley were studied in detail during the final alternatives phase. The characteristics of each are summarized below and measures for the evaluation criteria are included in the Appendix.

East Walnut Creek Site — A BART station on this four acre site located just south of Newell Avenue and east of the Southern Pacific tracks would displace a nursery and a parking lot and would require relocation of the Southern Pacific tracks. Parking would be in a four-level structure. Because of anticipated congestion on local streets, access to the site from the west would not be good. Shoppers and people going to the Kaiser Medical Center would be well served, but the outlying location would not be within walking distance for most downtown employees.

Central Walnut Creek Site — A subway station was proposed for the site currently occupied by Simon's Hardware store on the block served by Main Street, Olympic Boulevard, Botelho Drive, and California Boulevard. Because of its central downtown location, long-term parking would be too costly, and traffic congestion around the station would disrupt businesses. The highest potential for employment increases exists around this station with 20,000 of the 35,000 possible total downtown jobs projected to be within walking distance.

West Walnut Creek Site — This 11 acre site, bounded by Olympic Boulevard, California Boulevard, Botelho Drive, and I-680 currently is occupied by 32 single family homes, most of which are exposed to severe freeway noise. Commuters arriving from the east would encounter congestion on streets serving the station, and access from the south would be relatively poor if no new interchange is built. Short and long-term parking and bus and taxi service areas would be provided. Although the station is close to downtown offices, patrons from east Walnut Creek would have to travel through downtown to reach the station, a distinct disadvantage.

South Walnut Creek Site — This 12 acre site, which would be used only in conjunction with the Central Walnut Creek subway station, is between Danville Boulevard and I-680, 800 feet south of Rudgear Road. Five single family homes would be displaced in order to build a station offering parking for south Walnut Creek BART patrons who would not use the downtown station.

Livorna Road Site — The site serving the Alamo area would be in the northeast quadrant of the Livorna Road/I-680 interchange and would be used with the I-680 and Southern Pacific alignments through Walnut Creek. The 12 acre site on currently vacant land could accommodate 1,000 cars. Access from Livorna Road is anticipated to be good, and the station would have the largest 1990 tributary population of all of the sites in the San Ramon Valley — 47,400 persons.

Stone Valley Road Site — A station at this site, associated only with the subway alternative through downtown Walnut Creek, would be at the Stone Valley Road/I-680 interchange. The southwest quadrant of the interchange would be superior to the northeast quadrant from the standpoints of access and parking and is closer to the developed part of Alamo. However, neither site would have much walk-in potential. The 1990 projected tributary population is 35,400, and no nearby employment is expected.

Danville Station Site — An aerial station on the site between Laurel Drive and Sycamore Valley Road just east of the Southern Pacific tracks would displace 23 single family homes. Access for Danville residents would be good because none of the local streets will be congested in 1990. No expansion of highway commercial uses on Sycamore Valley Road is expected. This commuter station is projected to have a 1990 tributary population of 36,100.

San Ramon Station Site — An aerial station on a 10 acre site bounded by Crow Canyon Road, the Southern Pacific tracks, and a new road connecting Crow Canyon Road with Norris Canyon Road would cause no displacement. Access for San Ramon commuters would be good, especially for areas northeast of the station if Norris Canyon Road is extended across the Southern Pacific tracks to the future extension of Alcosta Boulevard. The station has one of the smallest tributary populations in the San Ramon Valley, 14,900, but would have 2,000 projected employees within walking distance.

Dublin Station Site — The best site for a BART station to serve the Dublin area would be on a vacant 10 acre parcel immediately south of the Contra Costa/Alameda County line at Kimball Avenue between Village Parkway and the Alamo Canal. Access to the station would be good with congestion anticipated only at Alcosta Boulevard and the I-680 diamond ramps. A 1990 population of 23,500 is projected to live within one mile of this station. Eastman Kodak and the Alcosta Shopping Center are expected to be the only job locations within walking distance.

Evaluation of the San Ramon Valley Corridor

The San Ramon Valley corridor was rejected because of higher cost, lower patronage potential, greater travel times for the majority of Valley out-commuters, and greater adverse impact on the natural environment. In comparison with a Dublin Canyon extension, San Ramon Valley lines were 4.5 to 5.9 miles longer and cost from $66 million to $109 million more. (Evaluations of alternatives are expressed in 1972 dollars.) The cost per mile was $500,000 to $2.3 million more for San Ramon Valley extensions primarily because more aerial structure would be required. Patronage estimates for the San Ramon Valley extension were 18 percent lower than for the Dublin Canyon extension in the RTTPP Task I test using 1980 population and employment and 36 percent lower for the RTTPP Task III 1990 test. With the RTTPP Task I patronage forecasts, BART staff estimated that operating costs for the San Ramon Valley extension would be 44 percent greater than for a Dublin Canyon extension, $0.98 per passenger-trip versus $0.68 per passenger-trip. Valley residents bound for Oakland and San Francisco would have to spend 15 minutes more time travelling via Walnut Creek than through Bay Fair. On a trip to Oakland City Center, this penalty translates into a 35-50 percent increase in travel time. The fact that less displacement would occur with a San Ramon Valley extension was considered a potential benefit, but in some people's mind this might be overshadowed by the adverse impacts on the natural environment and the slightly greater noise expected with the San Ramon Valley lines when compared with the selected route.

A further problem of a San Ramon Valley BART extension is the passenger overload on the Concord Line. Current 1980 projections for the existing BART system in full operation indicate that during peak periods there will be standees on the Concord Line, a condition that would be exacerbated by connection of a Valley Line at Walnut Creek and/or by a Pittsburg-Antioch BART extension. All BART patrons living west of Walnut Creek would be affected by a San Ramon extension, and by the time peak hour trains reached Rockridge Station there would be twice as many riders standing as sitting.

During public hearings on the corridor question and the final alternatives being considered for an extension to the Valley, the majority of Valley residents attending the meetings and the City Councils of Pleasanton and Livermore favored a Dublin Canyon route over any of the San Ramon Valley routes. Danville-Alamo residents expressing an opinion did not want BART in their communities. The Walnut Creek City Council was unanimously opposed to a BART extension through the San Ramon Valley. Walnut Creek councilmen expressed concern about the potential overload on the Concord Line from a BART extension to Pittsburg-Antioch and Livermore-Pleasanton. At none of the public hearings was there acceptance of the concept of Walnut Creek as a viable regional center to draw employment growth away from Oakland and San Francisco,

Detailed evaluations of the San Ramon Valley routes and stations are included in the Appendix. In the Appendix tables, it is possible to see at a glance what the principal corridor differences are by making paired comparisons between Dublin Canyon and San Ramon Valley lines that have the same Valley line segments.

Crow Canyon

A possible route from the Bay Fair Station through Crow Canyon north of I-580 to the San Ramon Valley and Dublin was abandoned early in the study after brief investigation. Extensive tunneling would be necessary, and the route is six miles longer than the Dublin Canyon alternates. The only gain would have been a modest improvement in transit service to the San Ramon area over a Dublin Canyon line, and Valley BART patrons would travel 14 minutes longer each day.

Niles Canyon/Mission Pass

In the Niles Canyon/Mission Pass corridor, two alternates were studied. One route follows the Southern Pacific railroad tracks through Niles Canyon from Sunol to Fremont paralleling State Route 84, assuming that the Southern Pacific would relocate its tracks to the Western Pacific right of way. If the present Southern Pacific tracks were to remain, additional aerial structure would be required. A second route along I-680 through Mission Pass to Fremont would require a three mile BART tunnel. This alternative would cost $55-75 million more than the Niles Canyon alignment. Half a dozen possible alternatives for connection to the Fremont Line were studied, including two that would be feasible with a BART South Bay Loop or a Dumbarton Crossing. The most efficient connection points for the Niles Canyon corridor would be midway between the Fremont and Union City Stations. A southern extension of the Fremont Line would be the preferred connection for a BART route through the Mission Pass corridor.

Construction cost for a Niles Canyon extension to Livermore was estimated to range from $195 to $215 million. Only 15 percent of Valley residents will travel to work through the Niles Canyon/Mission Pass corridor in 1990, according to the Regional Transit Travel Projections Project, and preliminary patronage forecasts indicate potential ridership would be about 60 percent below a Dublin Canyon extension, primarily because of the 7.5 minute travel time penalty for Oakland and San Francisco bound commuters. In addition to the drawbacks of low patronage potential and high cost relative to patronage, a Niles Canyon extension would provide poor service to the Dublin-San Ramon area and would cause more environmental disruption than an extension through Dublin Canyon or the San Ramon Valley. Finally, any potential impact that a BART extension could have on subregional office development in Fremont's central business district would be minor, at least until after 1990. For all these reasons, the Niles Canyon/Mission Pass alternates were dropped early in the study.

During discussion of the Preliminary Alternatives report, members of the Livermore-Pleasanton BART Extension Project Technical Advisory Committee questioned whether a longer term view of the need to link regional subcenters might be in the regional interest. A prime objective of such a policy would be to reduce growth pressures and employment concentration in Oakland and San Francisco and avoid overloading the existing BART system. Would a BART extension from Walnut Creek through Dublin and Fremont to San Jose achieve these objectives and, if so, would a Dublin Canyon Corridor extension effectively foreclose ultimate development of such an extension? A test using MTC/ABAG regional development and travel projections showed that in 1990 nearly 2,500 hours of additional travel time per day would result if the San Ramon and Niles Canyon lines were built in lieu of a Dublin Canyon extension. Furthermore, this transit extension would have an annualized capital cost premium of $18 per individual work trip over a twenty year period.

VALLEY ROUTE AND STATION ALTERNATIVES

Initially, 49 potential Valley station sites and two dozen links connecting these stations were identified and evaluated. The principal objective in the early phases of the study was to examine the ability of Valley stations to serve Valley residents effectively and to foster, if possible, compact development. Three distinct types of station locations were studied: in or adjacent to central business districts, in proposed major developments, and at outlying locations. Stations serving special facilities also were examined, but preliminary analyses showed high costs for providing transit service to these places. For example, a station serving the Lawrence Radiation Laboratory would not generate more than 800 trips a day, hardly enough to justify a $20 million construction cost premium for an extension of BART service beyond Livermore. A similar problem would occur with a station north of I-580 to serve the South County Junior College District campus, where a construction cost premium of $13 million would be necessary to serve 800 daily patrons. All of the Valley stations and links are shown on the Alternate Routes and Stations map. Eighteen of the Valley and corridor stations were retained for detailed analysis, and evaluation tables for these stations for 9 of the 14 planning objectives are included in the Appendix. The following descriptions of Valley stations and links highlight the major alternatives.

Dublin-Northwest Pleasanton Stations

In addition to the selected site at Stoneridge Drive and Foothill Boulevard, five sites with widely varying characteristics were studied: two north of I-580 and two to the south. For all of these stations the projected 1990 tributary population is 97,000 with a Dublin Canyon extension and 68,000 with a San Ramon Valley extension.

Dougherty Road/Southern Pacific Site — A station on this site opposite Camp Parks would be strongly affected by future development there. The federal prison one mile northeast is likely to preclude residential development near the station, and industry is the most likely surrounding use. This site would tie in only with a San Ramon Valley extension and would not serve the proposed regional shopping center.

Dublin Boulevard Site — A BART station located across from K-Mart on Dublin Boulevard in a mixed commercial-industrial area would attract some walk-in patronage from nearby employees but would serve no walk-in commuters. This station could be linked with both Dublin Canyon and San Ramon Valley extensions, but would not serve the Stoneridge Shopping Center.

Stoneridge Drive/Hopyard Site — A BART station west of Hopyard Road would be located on vacant land adjoining a single family residential tract to the south. The site currently is designated for industrial use but logically could be changed to allow residential development in the station area. However, the proposed regional shopping center on the other side of the freeway would be poorly served.

Stoneridge/I-680 Site — The 9 acre station site is bounded by the Alamo Canal, Johnson Industrial Drive, and Stoneridge Drive — a planned major four-lane arterial. This station was designed for use only with a San Ramon Valley extension to permit the best possible service to the proposed regional shopping center. Because the freeway would separate the transit station from the shopping center, interference between transit patrons and shopping center traffic would not be great. A people mover would be required to link the station to the regional center and the apartments, commercial activities, and offices planned for the area.

Only the Stoneridge/I-680 site and the Stoneridge/Foothill site were retained for analysis during the final alternatives phase of the study. The other alternatives were judged to offer inferior service to the Dublin-Northwest Pleasanton area and did not take advantage of the joint development opportunities at the proposed Stoneridge Regional Shopping Center, expected to have the largest employment concentration in the Valley. Furthermore, none of the rejected alternatives, could be used on a southern Valley route with a Dublin Canyon extension.

Pleasanton Stations

Four alternatives to the selected station site included two on open land near Santa Rita Road, one in downtown Pleasanton, and one in between. Tributary population in 1990 for these stations ranges from 39,000 to 44,000.

Las Positas/Southern Pacific Railroad Site — This 20 acre site in north Pleasanton would be within walking distance of the proposed 400 bed (1990) acute hospital planned by Valley Memorial Hospital as the major health care facility in the Valley, Primary access to the station would be good because both West Las Positas Boulevard and Santa Rita Road are expected to be uncongested.

Santa Rita Road/Arroyo Mocho Site — This site on open land south of the Arroyo Mocho and east of Santa Rita Road could accommodate maximum BART-oriented development on three sides. Access would be mainly from Santa Rita Road.

Radum Site — A BART station adjoining the Southern Pacific tracks at the Radum Wye would be adjacent to gravel pits that are likely to be reclaimed only for industrial use. Access would be good along the proposed Valley Avenue extension, and some potential for BART-oriented residential development exists north of Valley Avenue. However, most of Pleasanton residents faced with out of direction travel to reach this station probably would use the Dublin-Northwest Pleasanton Station instead.

Downtown Pleasanton Site — The best location for a downtown station would be along the Southern Pacific tracks between Ray Street and the Arroyo del Valle. However, the benefits of additional BART-oriented office and commercial development were judged to be offset by the disruption and displacement of 18 housing units and two businesses and the relatively poor walk-in potential from adjacent residential neighborhoods. It also is likely that selection of a downtown site would make off-street parking for downtown more costly to acquire and would reduce the supply of low cost housing and commercial space.

Only the Las Positas/Southern Pacific site was retained for analysis along with the selected Bernal/Main site during the final alternative phase of the study. The other stations were rejected because of low patronage potential, limited BART-oriented development opportunities, or locations that were not easily served by links connecting other viable sites.

In comparing the Las Positas/Southern Pacific site with the Bernal/Main site, advantages were noted for both sites. The principal drawbacks to the outlying site are that BART trip times for Pleasanton residents would increase an average of two minutes, and many south Pleasanton BART patrons might take the freeway to the Dublin-Northwest Pleasanton Station, thereby increasing congestion there. On the positive side, the Las Positas site would serve the new hospital. However, these benefits were not judged sufficient to outweigh the advantages of the southern Valley route and the Bernal/Main site.

Livermore Stations

Five alternatives to the East Livermore Station and the West Livermore Station were examined. For all of these stations projected 1990 tributary population is 87,500.

Portola/Murrieta Site — This 9 acre station site at the northwest edge of Livermore would be well served by four arterials. Only Portola Avenue is expected to experience significant congestion by 1990, so all of Livermore north of the railroad tracks would have good access to the station. However, patrons from southwest Livermore would have to travel out of direction, and the average travel distance for all users would be greater than to either of the downtown station alternates.

Downtown Livermore Site — This 11 acre site bounded by Chestnut Street, Livermore Avenue, Railroad Avenue, and "L" Street will be bisected by the Western Pacific tracks and the relocated Southern Pacific tracks. Access is restricted to Chestnut Avenue and Railroad Avenue, both of which are expected to be congested. The railroads preclude a vehicular connection between the two sections of the site, another

drawback to the location. While much of the older section of downtown would be within walking distance, the newer automobile-oriented development to the west would not, and patrons residing west of "P" Street would have to travel out of direction to reach the station. A subway alternate located 300 feet south of this downtown site under Railroad Avenue also was examined.

New Community Site — The possible transit-oriented new community north of I-580 discussed in the Valley Development chapter could be served by a BART station. The construction cost of an extension to serve the new community was estimated to be $31 million, or $900 for each prospective resident of the community. Detailed analysis of this station was not conducted as part of this study because it was considered a long-term possibility and not a part of the proposed rapid transit/community development concept.

The new town presents an opportunity to meet potentially unsatisfied demand for housing in the Valley within walking distance of BART. Policies and programs to facilitate local development coordination with a BART extension were not examined in relation to the new town concept. However, provision was made in the design of the Livermore Yard and the support facilities to permit an extension of BART to serve the new town if and when it becomes advisable.

Two separate comparisons were made among Livermore alternates: Downtown Livermore site vs. West Livermore site and Portola/Murrieta site vs. West Livermore site. The East Livermore site was the terminus for all alternatives. The Downtown Livermore site would cause more congestion than the West Livermore site because of poorer traffic access and greater anticipated patronage. Fewer walk-in commuters and fewer in-commute trips would be attracted to the Downtown Station. The Downtown site also could cause attrition in Livermore's low and moderate income housing supply because of BART-induced redevelopment. Finally, no evidence was found that increased retail sales to BART patrons using the Downtown Livermore Station would offset losses to local merchants due to congestion. In relation to the outlying site on Portola Avenue, the West Livermore site would have lower average travel time, less disruption and displacement, less walk-in potential, and greater in-commute potential, and would result in the best patronage distribution for two Livermore stations. For these reasons, the West Livermore Station was selected over all alternatives.

Valley Line Segments

The principal alternatives in the Valley were a northern and a southern route, although as the Alternate Routes and Stations map indicates, many combinations of links were examined. Early studies showed that a line from the Dublin Canyon corridor remaining in the I-580 median to Portola Avenue in Livermore and then turning south to the Portola/Murrieta site would not serve the Valley well. The accessibility to stations located within the freeway median was judged poor, and walk-in potential would have been negligible. While BART could be built on aerial structure in the freeway median, the line would have to go over the recently built interchanges, presenting construction problems and adverse visual impacts. If BART were to be at grade, the freeway would have to be widened by 50 feet and four or five interchanges reconstructed. This section of I-580 already is constructed to its planned eight lanes, so any reconstruction would be at BART's expense. These structural difficulties combined with poor access led to the abandonment of this alternative. Brief consideration also was given to a southern route branching west of the West Livermore Station along the Arroyo Mocho and heading east across the vineyards to the Lawrence Radiation Laboratory, but extreme disruption and low patronage potential at the Radiation Laboratory station justified rejecting this link.

The northern Valley lines would be less costly than the southern lines because they are shorter and require less aerial structure. They would cause less noise nuisance because they would have less housing nearby, except in comparison with the selected line with the subway alignment through Pleasanton. On the northern lines the portal to portal trip for the average Valley rider would be a half minute longer than with the southern Valley route because Valley residents will live closer to stations serving downtown Pleasanton and Livermore.

In Livermore, the selected route is the least cost alternative. An aerial structure on the same alignment or a subway alternative under Railroad Avenue also could be built. However, high cost and engineering problems make impractical any schemes for depressing BART and the two railroads under cross streets or putting BART on aerial structure over the railroad tracks. The construction cost premium for aerial structure through Livermore is $5 million (1972 dollars) and for subway is $40 million (1974 dollars).

In the Valley all of the displacement would occur in Livermore. The northern route serving the Portola/Murrieta Station would displace 70 mobile homes, 24 single family homes, and 6 businesses employing approximately 30 people. Of the alignment alternatives in downtown Livermore, the subway would displace the fewest people — only 4 businesses employing about 14 people would have to be acquired. An aerial alignment would displace two residential buildings and four businesses.

The analysis of the impact of BART alternatives on local government costs used three surrogate measures to indicate the potential magnitude of impact: land used by BART, total travel, and amount of land urbanized. The BART alternate requiring the least land outside existing public rights of way would leave the most land available for whatever uses the local communities decide are socially or economically justifiable. The northern Valley routes would take over 100 acres of private land and only 6 to 11 acres of public land, 45 more acres of private land than the selected route. Whether this would result in lower government costs could only be determined after a detailed market study of the alternative uses to which the land not acquired could be put and the shift that would occur in total land use within the taxing jurisdiction. If it is assumed that land use efficiency and lower government costs are closely correlated, then the northern routes are less desirable than the southern route.

Assuming the same patronage on a northern or southern Valley line, the amount of travel on local streets to reach BART stations affects street construction and maintenance costs and local transit mileage. The northern routes all require more travel to stations and, therefore, could increase local government costs for streets, bikeways, and feeder bus service.

The final measure, amount of land urbanized, did not show significant differences among the lines because opportunities for high density BART-oriented housing exist on all Valley line segments. To the extent that BART would encourage compaction and foster higher densities, local governments would realize significant savings in utilities and street construction and maintenance costs.

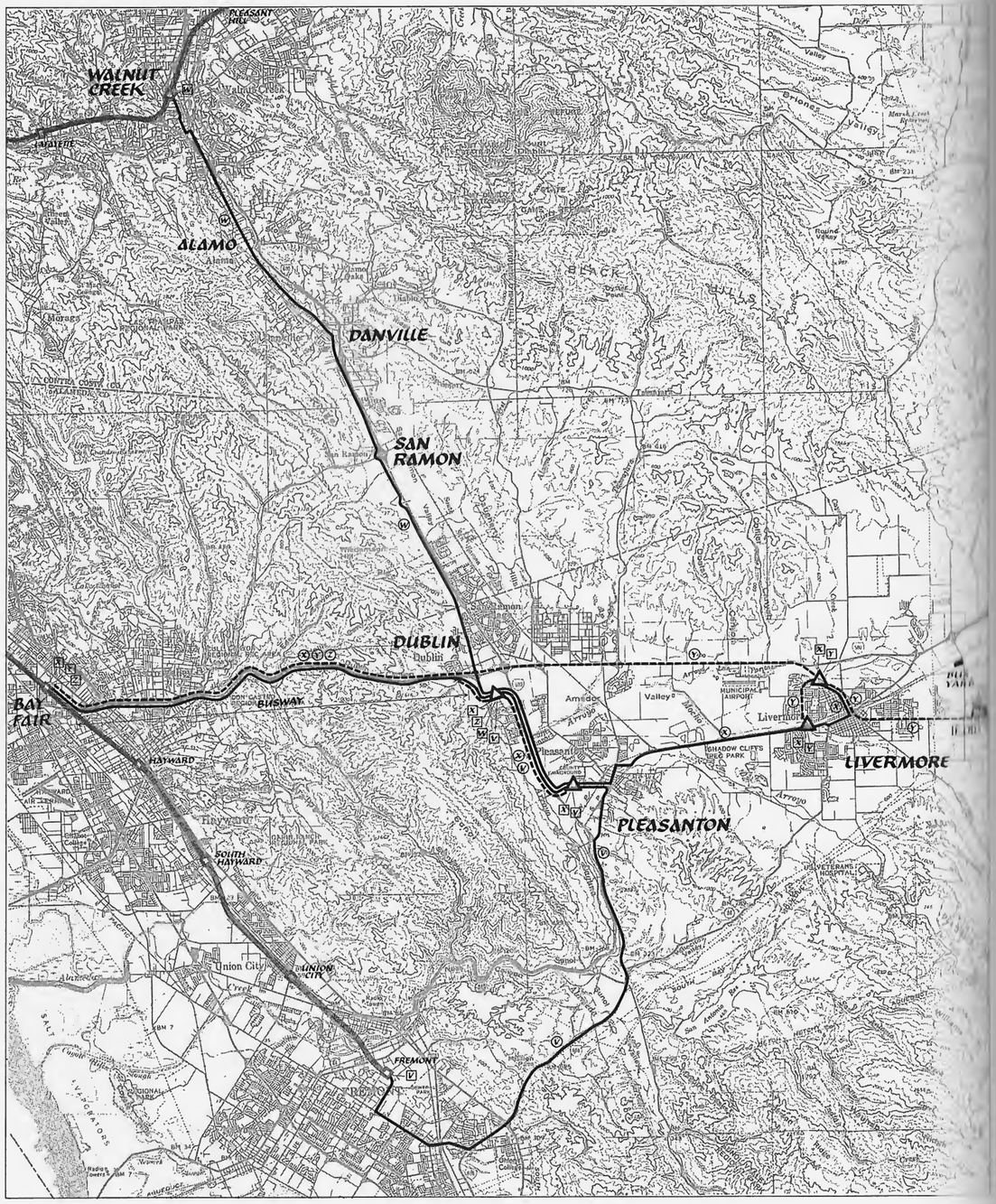
Only northern routes have the potential to affect historical sites in the Valley. The Alexander Eden home, built in the 1850's and still in good condition, might have to be moved to accommodate a BART line west of the Portola/Murrieta Station. None of the alternates studied would affect state or national historical landmarks.

For other natural environmental factors considered, northern line segments might have slightly fewer problems. The analysis of geologic factors showed the northern lines ranked above the recommended route primarily because less lineal feet of line would be exposed to slope stability problems. None of the Valley line segments would cause significant alteration of natural landforms, and most of the affected area is expected to be urbanized whether BART is extended or not.

NO-PROJECT ALTERNATIVE

In transportation planning today, the "do-nothing" alternative cannot be ignored. Not only must it be evaluated in the environmental impact assessment process to meet state and federal requirements, but it also has to be viewed as the benchmark against which alternatives are tested. In the case of highway construction, the alternative of no action often may have beneficial environmental effects. However, in transit planning, no action in all likelihood will only further reliance on the automobile and hinder implementation of the Clean Air Act and transportation control plans to achieve and maintain air quality goals. The need for effective rapid transit service to the Valley is recognized by BART and MTC as well as the residents of San Ramon, Dublin, Pleasanton, and Livermore, and interim bus service already has begun. Consequently, a policy of no action would run counter to the public interest.

Regional Express Bus Routes and Park/Ride Stations



ALL DAY SERVICE

PEAK PERIOD EXPRESS SERVICE

ROUTE DESIGNATION

ROUTE TERMINUS

PARK-RIDE LOT

EXISTING BART ROUTES AND STATIONS

BUS ALTERNATIVE

THE SYSTEM

A bus system designed to serve travel needs of the Valley could be an alternative to a rail extension. Such a system would offer much faster and more frequent service on many more routes in the Valley than the service to Bay Fair recently inaugurated. The Bus Alternative, depicted on the Regional Express Bus Routes and Park/Ride Stations map, consists of express or limited-stop trunkline bus service on a two-way busway in the median of I-580. All buses traveling through Dublin Canyon would use the busway in order to operate at maximum speed limits during periods of I-580 freeway traffic congestion and to avoid weaving across slow truck lanes. Express bus service would be provided directly to the Bay Fair BART Station where bus passengers would be able to transfer to BART or to other buses serving the BART Station. Special bus ramps would be constructed to facilitate bus travel between the I-580 busway and the Bay Fair Station, and bus loading improvements would be added at the Bay Fair Station to provide convenient, rapid transfer between express buses and BART.

In the Valley, the trunkline bus service would be supported by park/ride stations and by feeder bus systems. Park/ride stations would be located at the Stoneridge Regional Shopping Center in Dublin, at the Alameda County Fairgrounds in Pleasanton, and in West Livermore at the intersection of Murrieta Boulevard and Stanley Boulevard and in North Livermore near the intersection of Portola Avenue and Murrieta Boulevard.

Buses would operate in local collection service within San Ramon, Dublin, Pleasanton, and Livermore, make stops in the park/ride stations, and then continue directly to the Bay Fair BART Station on the busway. By combining local and trunkline service, the need for a transfer at the Valley end of a transit trip would be eliminated for many riders.

All-day trunkline bus service to Bay Fair would be provided with one route through downtown Livermore and downtown Pleasanton. Intermediate stops would be made at all park/ride stations in the Valley, During peak commuting periods, supplemental express lines would operate between each Valley park/ride station and the Bay Fair BART Station.

As with a BART extension to Livermore, trunkline bus service would be provided between Pleasanton and Walnut Creek via San Ramon Valley and from Pleasanton to Fremont via I-680 (Mission Pass). During peak commuting periods, supplemental lines would be operated between Danville and Walnut Creek.

Components of the Bus Alternative, as well as alternatives to the recommended plan, are discussed in the following sections. For purposes of description and evaluation, the Bus Alternative corresponds to a 1990 bus system. However, the system could be implemented as soon as I-580 is reconstructed.

1990 Bus Routes

The Bus Alternative with minor modifications was first delineated by BART staff. The routes form a north-south axis and an east-west axis meeting at the Dublin-Northwest Pleasanton Park/Ride Station. All-day trunkline service in the north-south direction connects Pleasanton with Walnut Creek and with Fremont. In the east-west direction, an all-day trunkline connects Livermore and Pleasanton with the Bay Fair BART Station. These lines would operate the same hours as the BART system, providing "limited stop" service along highways and arterial streets in addition to stops in community centers and park/ride stations. All-day service to the park/ride stations assures commuters of mid-day and evening return service to their parked cars. Schedules of these lines would be coordinated so that buses proceeding north, south, east, and west would meet at the Dublin-Northwest Pleasanton Park/Ride Station, providing direct transfer connections.

During morning and evening commute periods, these lines would be supplemented by three routes providing nonstop service between the Bay Fair BART Station and each of the park/ride stations in the Valley. Service on these lines would be predominantly directional — to Bay Fair in the morning peak and from Bay Fair in the evening peak. One route would provide service from the two park/ride stations in Livermore to Bay Fair. On the return portion of this run, some of the buses would be routed to East Livermore to accommodate reverse-direction BART commuters to the Lawrence Radiation Laboratory and neighboring Sandia Laboratories. The second route would connect the Pleasanton Park/Ride Station at the Alameda County Fairgrounds with the Bay Fair Station. The third route would provide service between San Ramon, Dublin, and the Dublin-Northwest Pleasanton Park/Ride Station and the Bay Fair Station. Peak-period demand on these lines is projected to be quite high, allowing bus headways to be as low as one minute for service to Livermore, 2½ minutes to Pleasanton, and 4½ minutes to San Ramon/Dublin.

Trips on the three lines would extend beyond the park/ride stations, providing local collection and distribution within the communities. Typical extensions of these commuter lines into local residential areas of Dublin, San Ramon, Pleasanton, and Livermore are shown on the Valley Express Bus Routes and Park/Ride Stations map. Exact routing and level of service for this collection/distribution function would be studied in more detail prior to implementation of the Bus Alternative. For the purpose of this analysis and to allow a fair comparison between the Bus Alternative and BART, it is assumed that the quality of the local feeder service to the BART stations is comparable to that serving the park/ride stations.

The local collection/distribution shown on the Valley Express Bus Routes and Park/Ride Stations map is a peak-period service only. During off peak, service would be reduced to the east-west and north-south trunklines previously described, and, as a consequence, a greater percentage of transit patrons would have to depend on their automobiles to get to a bus stop during off peak than during peak periods. This reduced service and the absence of a travel time advantage of bus over auto during off peak will tend to reduce off peak transit patronage. With BART rail extension to Livermore, transit speeds would remain high throughout the day, thereby remaining more competitive with the automobile during off peak hours.

The following detailed description corresponds to the individual routes shown on the Regional Express Bus Routes and Park/Ride Stations map and the Valley Express Bus Routes and Park/Ride Stations map. Travel times between the Valley park/ride stations and selected locations on the BART system are shown in Table 24 (page 100).

Line X, the basic all-day Valley service, would operate nonstop between the Bay Fair BART Station and the Dublin-Northwest Pleasanton Park/Ride Station on the I-580 busway. Between Bay Fair and the I-580 busway, buses use Elgin Street. East of the Busway, the proposed route follows Old Dublin Road and Foothill Road to the park/ride station in the proposed Stoneridge Regional Shopping Center and then continues along Stoneridge Drive and turns south onto I-680. Turning off the freeway, the route follows Bernal Avenue first to the Pleasanton Park/Ride Station at the Alameda County Fairgrounds and then Main Street through downtown Pleasanton. From there, the route continues on Stanley Boulevard to the West Livermore Park/Ride Station, and then along First Street to downtown Livermore. Here, the route turns onto North Livermore Avenue and than onto Portola Avenue, finally reaching the North Livermore Park/Ride Station.

Line W would provide all-day service between the BART Station at Walnut Creek and the Dublin-Northwest Pleasanton Park/Ride Station. South of the Walnut Creek BART Station, the route follows California Boulevard, Newell Avenue, South Main Street, Danville Boulevard, and San Ramon Valley Boulevard through the communities of Alamo, Danville, and San Ramon, and continues on San Ramon Road and Foothill Road to the Dublin-Northwest Pleasanton Park-Ride Station.

Line V would provide all-day service between the Dublin-Northwest Pleasanton Park/Ride Station and the Fremont BART Station through the Mission Pass (I-680) corridor. From the Dublin-Northwest Pleasanton Park/Ride Station, the route follows Stoneridge Drive, I-680, and Bernal Avenue to the Pleasanton

Valley Express Bus Routes and Park/Ride Stations

ALL DAY SERVICE

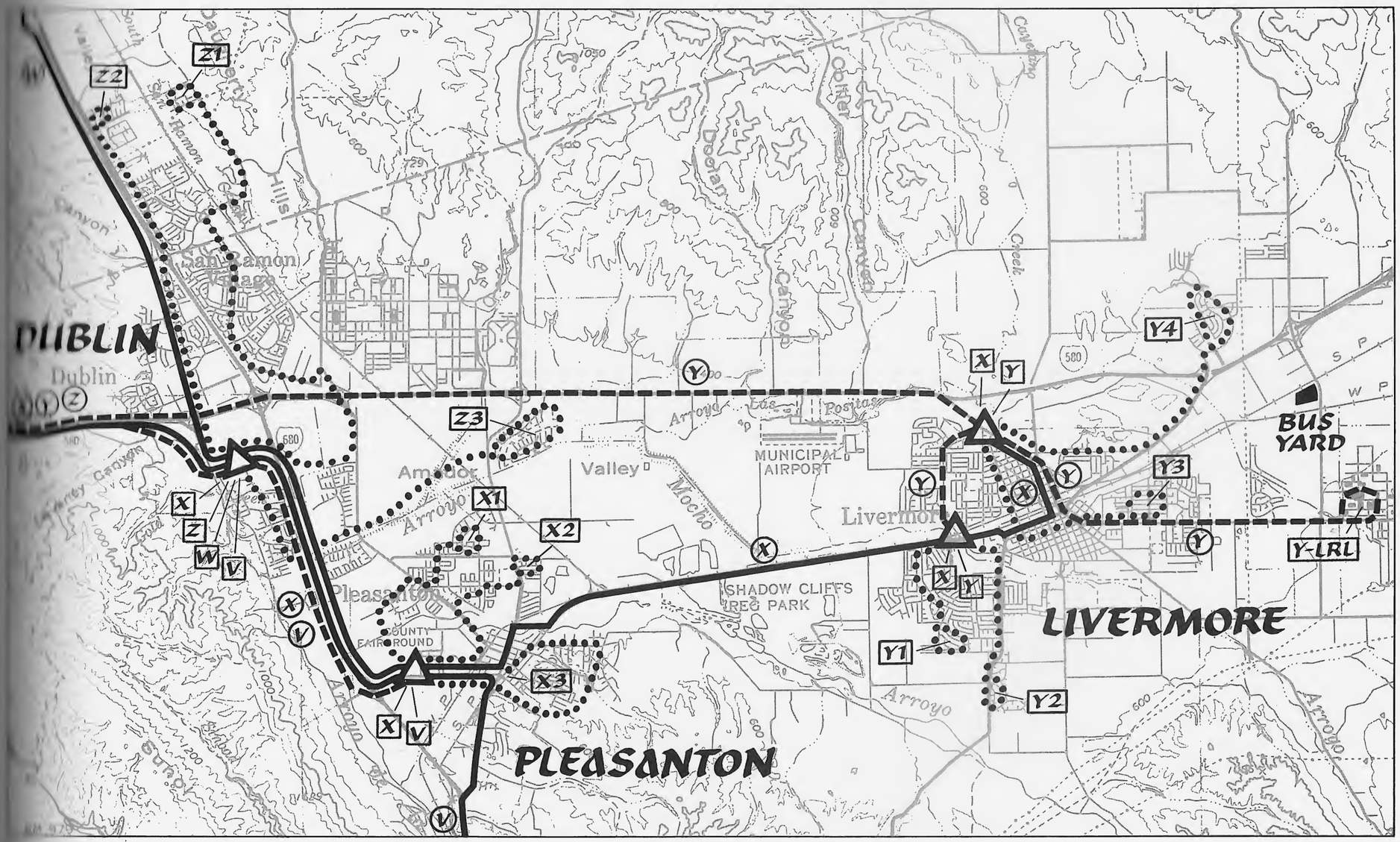
PEAK PERIOD EXPRESS SERVICE

LOCAL PORTION OF PEAK PERIOD EXPRESS SERVICE

ROUTE

ROUTE TERMINUS

PARK-RIDE LOT



Park/Ride Station. The return route is along Bernal Avenue, Main Street, Sunol Boulevard, I-680, Washington Boulevard, Fremont Boulevard, and Walnut Avenue to the Fremont BART Station.

Line X-Short would provide nonstop service between the Bay Fair BART Station and the Pleasanton Park/Ride Station on the same route as Line X. During the peak hours, buses from the Pleasanton Park/Ride Station would stop at the Dublin-Northwest Pleasanton Park/Ride Station only if they still had room for additional passengers.

Beyond the Pleasanton Park/Ride Station some of the buses would perform a neighborhood collection/distribution service. Examples of these local runs in Pleasanton are shown as X_1, X_2, and X_3 on the Valley map.

Line Z would provide nonstop service between the Bay Fair BART Station and the Dublin-Northwest Pleasanton Park/Ride Station. Some of the buses would continue on local streets into Dublin, North Pleasanton, and San Ramon to provide collection/distribution service. Examples of these runs, labeled Z_1, Z_2, and Z_3, are shown on the Valley map.

Line Y would provide nonstop service between the Bay Fair BART Station and the two park/ride stations in Livermore. This route would leave the I-580 busway on a slip ramp west of Foothill Road and continue on I-580 in mixed flow to Portola Avenue in Livermore and then to the North Livermore Park/Ride Station. About one-third of the Line Y buses would continue on Murrieta Boulevard and Stanley Boulevard to the West Livermore Park/Ride station. Beyond both park/ride stations some buses would offer local collection/distribution service in Livermore neighborhoods, including Springtown and Las Positas, as shown on the Valley map.

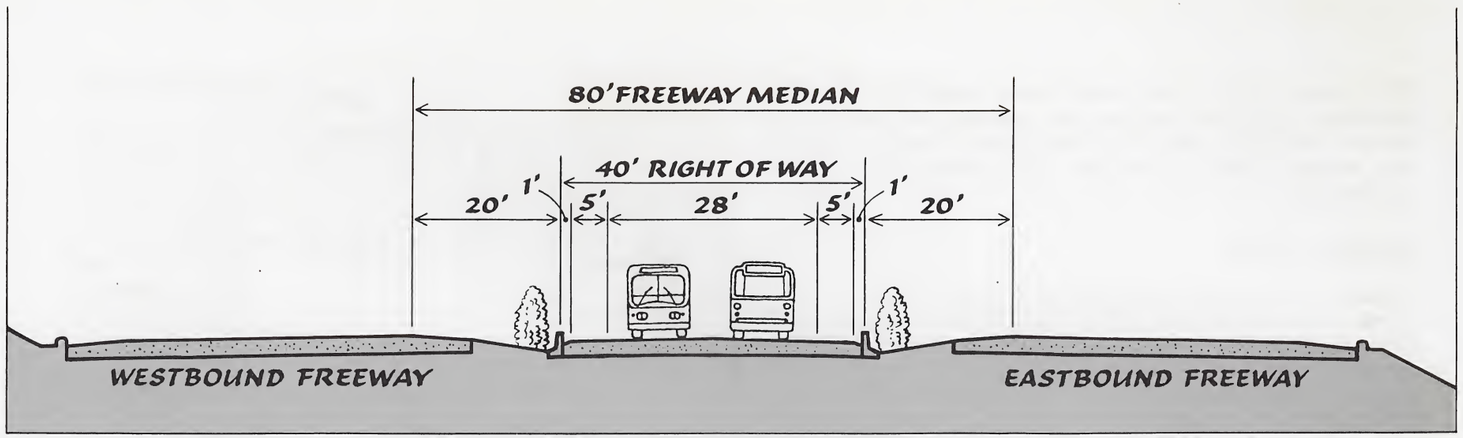
Line Y-LRL is the reverse direction of Line Y. Between the Bay Fair BART Station and the Portola Avenue interchange at I-580, the route is identical to Line Y. From the freeway interchange, Line Y-LRL runs along Portola Avenue, North Livermore Avenue, and East Avenue to the Lawrence Radiation Laboratory. The portion of the line within Livermore would provide limited stops, thereby offering Livermore residents transit service to the Radiation Laboratory. Because demand for this service is significantly less than for Line Y, only some of the Line Y buses would be routed to the Radiation Laboratory.

I-580 Busway

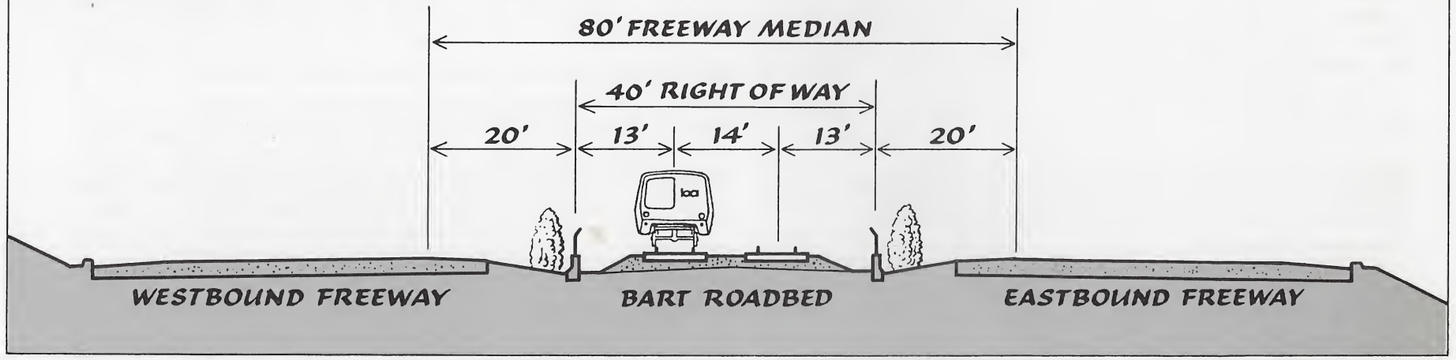
When Route I-580 through Dublin Canyon is reconstructed, a median will be provided to allow for future construction of additional freeway lanes or alternate modes of transportation such as a busway or a BART rail line. An 80 foot median is proposed, of which 40 feet would be reserved for BART rail or other modes. The freeway construction project extends from State Route 238 west of the East 14th Street interchange in San Lorenzo to I-580 east of Foothill Road in Dublin. The vertical and horizontal alignment of the freeway is being designed to BART rail standards with a maximum adverse grade of 3.4 percent and a minimum horizontal curve of 3,040 feet. Assuming a standard crown (no superelevation) throughout, this design would allow a maximum safe speed for buses of 69 miles per hour. With the use of superelevation (+3 percent) the safe speed could be increased to 80 miles per hour operation. With the most restrictive alternative, the busway could be operated safely at pre-energy crisis maximum speed limits and, under the most advantageous conditions, at maximum BART rail speeds.

The busway could be designed to allow for conversion to a BART rail system with a minimum of modification to roadbed and structures as long as entrance and exit structures are built to BART rail standards. This compatibility with BART could be achieved without compromising the quality of service on the busway and would allow the busway to serve the transportation needs of the Valley indefinitely, yet permit conversion to BART rail at any time. The capacity of the busway is sufficient to handle 1990 BART rail patronage.

Two I-580 busway alternatives were studied: a one-way, reversible busway and a two-way busway. The advantages of the two-way busway include lower capital and operating cost, maximum compatibility with BART rail, greater safety, and higher operating speeds. (See Rejected Alternatives for detailed analysis of a one-way reversible busway.) For these reasons, it was chosen for comparison with the selected BART extension. Six foot shoulders on each side, when combined with 14 foot travel lanes, allow buses to bypass a disabled vehicle. For comparison, a typical section for BART rail at grade also is shown. Both modes occupy 40 feet of the 80 foot freeway median. The structural section of the busway could serve as the roadbed for the BART track upon conversion.

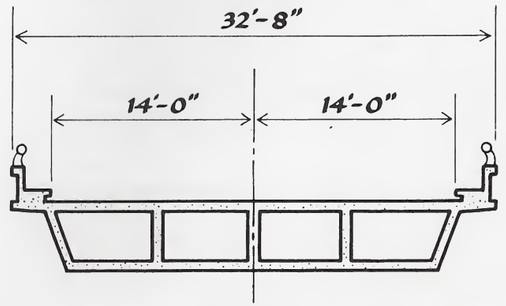


Busway Section in I-580 Freeway Median, Castro Valley to Dublin



I-580 Freeway Median Section, Castro Valley to Dublin

The second busway section illustrates a typical busway bridge structure. Here, the dimensions and structural section are identical to that of BART rail bridges on the existing system. Buses would have to use a portion of the opposing lane to get around disabled vehicles, but because these bridges would be relatively short (200 feet), the probability of this happening is quite low.



Busway Bridge Section

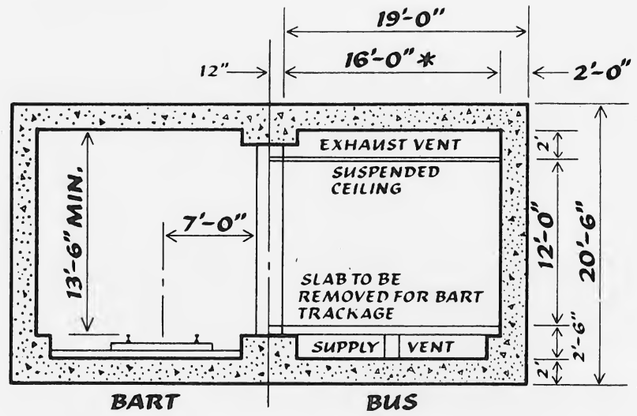
The busway would be used by all buses, in both directions, at all hours of the day. Because the buses always will be operating free of any freeway congestion, service levels will be high, and schedules met consistently.

West End Busway

The west end busway would provide a direct, high-speed connection to the Bay Fair BART Station. West of East 14th Street, the busway would follow the ultimate BART alignment, cross under the westbound freeway lanes of State Route 238, and would continue north as an exclusive busway to Elgin Street (see pages 89 and 90). Construction of a double box structure under the westbound freeway lanes and its approaches would require modifying 1,500 feet of State Route 238 beyond the western limits of the proposed I-580 widening project. As currently planned, State Route 238 would have a gradual transition from a six-lane section with an 80 foot median east of East 14th Street to the existing four lane section west of the BART and Western Pacific tracks. To allow for the busway structure, the full 80 foot median must be maintained further west than originally planned, as indicated in the plan diagram. To avoid reconstructing the freeway twice, the proposed I-580 widening project could include these modifications to State Route 238 to accommodate the double box structure, and even actual construction of the box structure.

The busway structure under the freeway lanes could be built to BART rail standards with increased horizontal clearance to allow for buses. For comparison purposes and to show how the structure could be converted to BART rail, the section shows the box to the right of the center wall for bus use and the left box for BART rail. This structure is one foot four inches higher and two feet wider than a typical BART rail section because it must be vented. An air supply is pumped into the tunnel through ducts located under the pavement slab and exhausted through the top ceiling ducts. These ducts and the pavement slab would be removed when BART rail is installed. The increased width provides for shy-away distance to the structure walls as well as safe stopping sight distance on horizontal curves.

The busway structure must be a minimum of 750 feet long to clear the westbound freeway lanes. If State Route 238 is widened to the planned eight lanes, the busway access structure will have to be lengthened to about 1,000 feet. However, this project is not in the 20 year planning program of CALTRANS.



* THIS DIMENSION MAY HAVE TO BE INCREASED SLIGHTLY TO PROVIDE FOR ADEQUATE STOPPING DISTANCE.

BART/Busway Structure Section into Route 238 Freeway Median

After leaving the box section, the busway would be parallel to the existing BART alignment up to Elgin Street. Buses would use the street for the remaining one-half mile to the Bay Fair BART Station and could operate at 55 miles per hour until they enter the station for a travel time savings of 2 minutes per trip. To allow safe operation of buses at high speeds on this street, it would be necessary to acquire all residential property fronting on Elgin Street between Ashland Avenue and the Bay Fair Station. Because this right of way also must be acquired for BART rail, the cost under either alternative is equal. However, this alternative was not assumed for the base case even though it would reduce travel times.

To insure the safety of pedestrians and bicyclists, a sidewalk and a bike path should be located near the east end of the property line, as far away from the roadway as possible. With these precautions, it should not be necessary to construct a frontage road parallel to Elgin Street or to convert Elgin Street into an exclusive busway. Elgin Street traffic volumes are anticipated to be quite low, and the capacity is great enough to minimize potential bus/car conflicts. At the busway exit south of Ashland Street, the intersection will have to be channelized to assure buses the right of way and to minimize entry into the busway of unauthorized vehicles. Stop sign control of the intersection should be sufficient to control the intersection, but a bus-actuated traffic signal could be installed, if necessary.

THIS DIMENSION MAY HAVE TO BE INCREASED SLIGHTLY TO PROVIDE FOR ADEQUATE STOPPING DISTANCE.

n

n

East End Busway

The east end busway would provide a direct connection to Foothill Road and to the I-580 freeway lanes east of Foothill Road. The busway would leave the I-580 median one half mile west of Foothill Road, cross over the eastbound freeway lanes, and descend to grade at the intersection with Old Dublin Road (see page 87).

To preserve flexibility for ultimate conversion, the structure over the eastbound freeway lanes would be built to BART standards on the recommended BART alignment, and the bridge cross section would be identical in width to that shown on page 84. The southeast approach to the structure is required only for the busway.

The intersection of the busway and Old Dublin Road could be channelized to ensure free bus movement. Because traffic on Old Dublin Road is projected to be very light and less than 100 buses would be running during the peak period, stop sign control at Old Dublin Road would be adequate.

All buses to Dublin, San Ramon, and Pleasanton would use the busway structure in both directions. Buses to Livermore would continue on I-580 in mixed traffic east of Foothill Road. East of Foothill Road, I-580 already is constructed to the ultimate eight lanes, and the median is not wide enough to accommodate a busway. However, CALTRANS 1995 traffic projections indicate that the Dublin to Livermore I-580 segment will not be congested during peak periods. Reverse bus lanes could be installed if congestion does impair bus service.

To allow Livermore buses access to the busway, median slip ramps would be provided west of the busway exit structure. Eastbound buses would leave the busway and merge with I-580 freeway traffic east of the Foothill Road off ramp. To help westbound buses reach the freeway lane closest to the median and allow a high-speed exit from that lane, a "bus only" auxiliary lane would be built inside the inner most freeway lane, beginning at the start of the uphill grade west of Foothill Road and ending at the busway slip ramp. As buses begin climbing the uphill grade, they begin to decelerate, and the speed differential between the buses and freeway traffic would increase. Without the auxiliary bus lane, this speed differential could create a potentially unsafe condition.

Park/Ride Stations

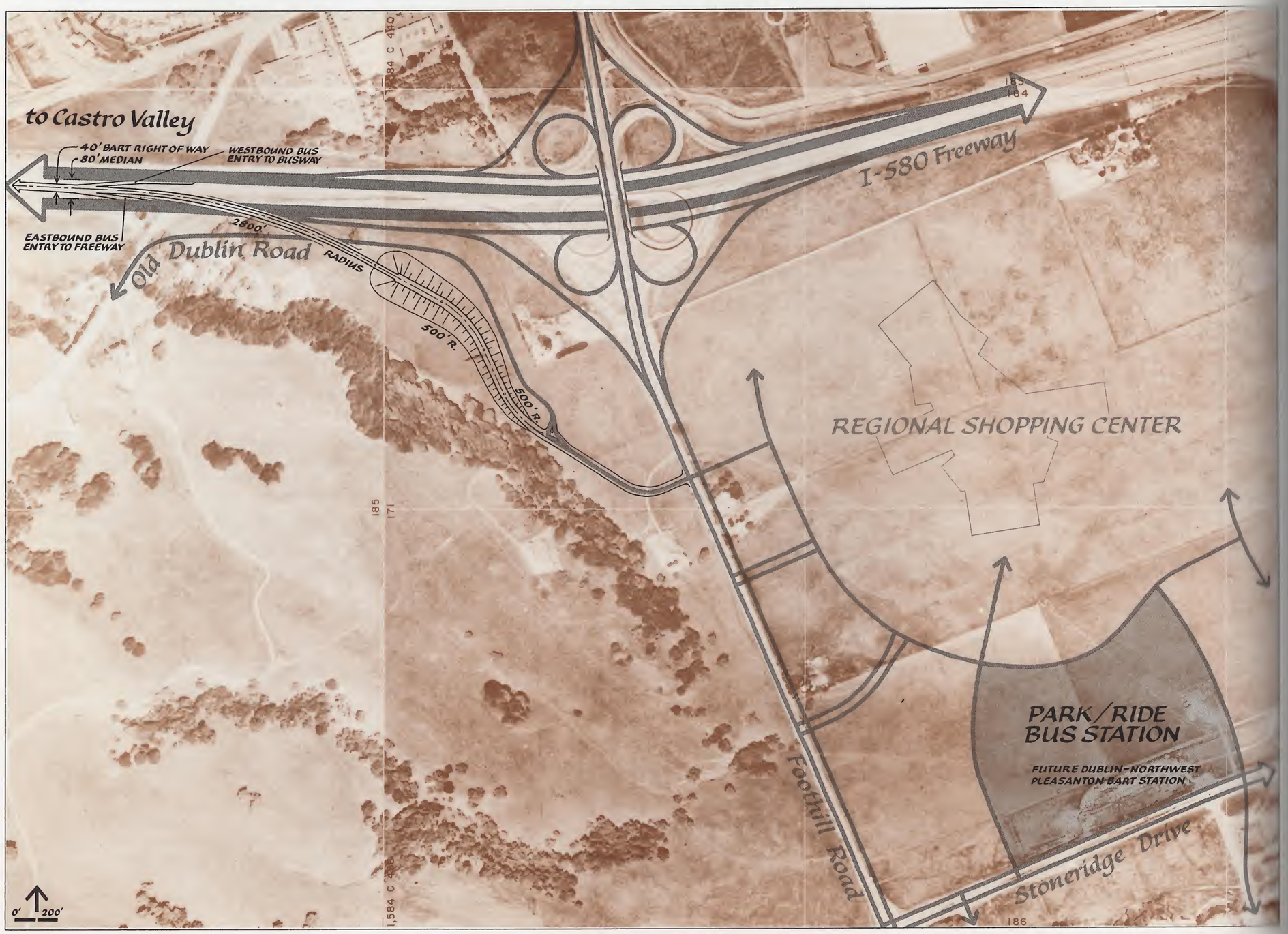
The four park/ride stations in the Valley, proposed for the 1990 Bus Alternative, would be located to minimize time spent on slow, local streets and to provide convenient, direct access with little or no out of direction travel.

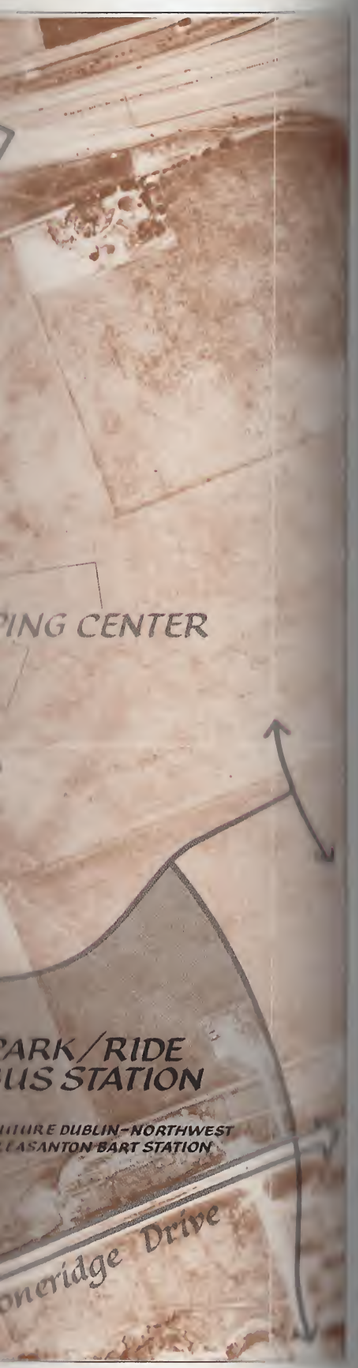
To provide a fair comparison between the Bus Alternative and BART, it is assumed that the proportional distribution of access modes — feeder bus, drop off, park/ride would be the same as with the BART Alternative and that feeder bus service to the park/ride stations would be comparable with BART feeder service. With the Bus Alternative, express buses would perform a collector function prior to entering the park/ride stations, but the headways on the local portions of these runs would be relatively long and travel time relatively slow because each express route splits into several local or feeder runs. Consequently, many patrons would find it advantageous to drive to the park/ride stations, and, no significant saving in parking would be realized with the express bus system over the BART rail system. However, the bus patronage is expected to be two-thirds of BART patronage so one-third less parking is needed at the park/ride stations.

Dublin-Northwest Pleasanton Station — The 9 acre Dublin park/ride lot planned for the initial BART express bus service northwest of the San Ramon Road and Dublin Boulevard intersection would not be incorporated into the 1990 express bus system. Instead, the Dublin-Northwest Pleasanton BART Station site would be used because it is closer to Pleasanton and is more accessible from the busway. With completion of the proposed Stoneridge Drive/I-680 interchange, this site would be more convenient for many bus patrons arriving from Dublin and San Ramon than the Dublin park/ride lot.

Up to 1,500 cars could use the 14 acre lot. All buses from San Ramon and Dublin and most buses from Pleasanton would be routed through this station, about 60 buses during the peak hour or a bus every minute in 1990. Pleasanton buses that are already full when they leave the Pleasanton Park/Ride Station could bypass the Dublin-Northwest Pleasanton Station with a travel time saving of 1 to 2 minutes per bus. Pleasanton buses that do not stop at Stoneridge could not be routed via I-680 to I-580 because of the insufficient weaving distance between the I-680 interchange and the I-580 busway slip ramps. These buses still would leave I-680 at Stoneridge Drive and enter the I-580 busway at Foothill Road and Old Dublin Road.

Busway Entry/Exit I-580 Freeway Median Dublin-Northwest Pleasanton





Pleasanton Station — The existing parking lot at the Alameda County Fairgrounds on Bernal Avenue in Pleasanton would be used for commuter parking, requiring some capital expense for paving. The peak fairgrounds attendance occurs on weekends during the annual county fair, and the present parking area would be able to accommodate fairgrounds events as well as commuter parking on weekdays.

By 1990, 1,400 parking spaces on 13 acres would be provided to accommodate projected patronage from the same traffic shed as the Pleasanton BART Station.

Livermore Stations — To accommodate almost 3,000 peak hour transit riders in Livermore by 1990, 2,500 parking spaces would be needed at park/ride facilities in Livermore. A single parking facility would create excessive traffic congestion and local air pollution, and would require out of direction travel for many patrons, so two stations would be provided.

The 14 acre North Livermore site on vacant land north of Portola Avenue near Murrieta Boulevard would allow express buses direct access to I-580 and would serve patrons from north and east Livermore. A maximum of 1,500 parking spaces would be provided. The 1995 CALTRANS traffic projections indicate that significant congestion will occur on Murrieta Boulevard and Portola Avenue. If the controversial Route 84 Freeway is not constructed, congestion will be greater.

The West Livermore Park/Ride Station would be on the site of the proposed West Livermore BART Station. Up to 1,000 parking spaces, on 9 acres of land, would be required by 1990. This site could be expanded to 24 acres when the second phase of the Livermore railroad relocation project is completed.

Two park/ride stations in Livermore would have the advantage of shortening the feeder portions of the bus service, and reducing vehicular traffic across the railroad tracks through Livermore to the North Livermore Station. The fact that both stations are on the all-day bus service route is particularly important to commuters returning home during off peak hours. However, the disadvantage of this plan is the relatively slow express bus run from the West Livermore Station to I-580. Only buses from the West Livermore Station with empty seats would be routed through the North Livermore Station.

Bay Fair BART Station Connection

All Valley buses would enter the Bay Fair BART Station from Elgin Street, travel on a counterclockwise loop around the east parking lot, and discharge or pick up passengers at the east station concourse.

With addition of the busway through Dublin Canyon to serve the Valley, as well as anticipated ridership increases on existing AC Transit routes feeding the Bay Fair Station, major improvements to the bus loading area would be needed. To alleviate the existing deficiency, a 100 foot extension of the present bus loading platform is required.

To accommodate Valley patronage fourteen additional new bus stop zones on two new busbays would be provided, one 600 and the other 520 feet in length, as shown on the plan. The third bay, 550 feet in length, would serve auto drop off patrons. One-third of the eastern busbay will serve AC Transit's East 14th Street lines, while the remaining two-thirds and the entire 600 foot western busbay would serve express buses to the Valley. A pedestrian tunnel with escalators to the concourse area as well as to the bus loading platforms and drop off lane would serve all transferring passengers. A positive barrier would prevent passengers from crossing the busbays at grade. The bus loading platform should be covered for passenger comfort. Buses would enter and exit the western busbay only via Elgin Street and Bertero Avenue, but the eastern busbay would be accessible from East 14th Street and Elgin Street. The drop off lane would be accessible from both directions. However, no exit would be permitted to Elgin Street. These additional busbays and changes in station circulation would eliminate 160 parking spaces in the east parking lot.

To ensure adequate bus loading space for AC Transit, a new 200 foot bus loading platform would be added on the west side of the station with direct access to Hesperian Boulevard, as shown on the Bay Fair Station Bus Modification plan. To accommodate this new loading area, 55 parking spaces on the west side of the station would have to be removed.

Bay Fair Station Bus Modification Plan

Busway Entry

Busway Entry/Exit Route 238 Freeway Median Plan

In summary, proposed modifications to the Bay Fair Station to accommodate 1990 bus service would result in a loss of 215 parking spaces, 15 percent of the present capacity. BART's 1990 patronage projections with BART service to Livermore indicate that with 25 percent of the patrons on feeder buses, up to 1,800 parking spaces will be required, assuming a BART station in Castro Valley. If only about 1,200 spaces are available, a much higher number of patrons will have to use feeder buses. Because of the projected parking deficiency, no space would be available to store buses during midday at Bay Fair.

Prior to commencement of BART transbay service, the Transbay Terminal in San Francisco served about 15,000 peak hour bus passengers. In 1990, the Bay Fair Station would be expected to serve over 6,500 peak hour bus passengers from the Valley and about 800 peak hour passengers from local AC Transit buses. At Bay Fair, in contrast to the Transbay Terminal, all passengers transfer to another mode. With 20 BART trains each way during peak hours, an average of 370 passengers — 330 of whom are Valley passengers — would be transferring to or from each train.

To accommodate the projected 1990 Valley bus patronage within the BART station, fare collection equipment would have to be expanded and the capacity of the vertical circulation system increased. Ten additional ticket vendors, 3 addfare machines, 6 coin changers, and 7 ticket gates would be added, and an additional escalator provided.

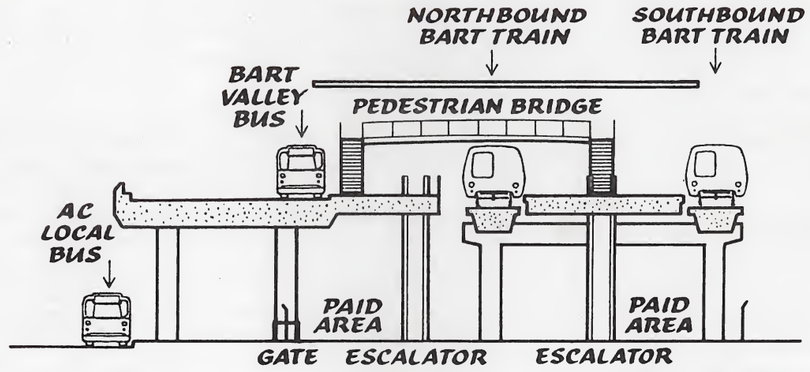
High Capacity Transfer Facilities — If significant increases in patronage occur over what is projected, then additional transfer facilities must be constructed. The busway would have sufficient capacity to handle twice the projected volume. If the Bus Alternative were to handle the same patronage as projected for BART, approximately 600 feet (a third bay) of additional bus loading platform would be required to handle the 3,000 additional peak hour patrons. The hourly bus volume arriving at Bay Fair would increase by 60, from 120 to 180. If the additional busbay is built at grade, 80 parking spaces would be lost, increasing the projected parking deficit. The additional peak hour buses also would increase congestion within the station area. Because of these constraints, the daily capacity of the transfer facilities is estimated to be 20,000 passengers.

To handle patronage significantly higher than that, all busbays and bus roadways would need to be built either above or below ground. Bus exhaust considerations favor an upper level. Furthermore, the additional bus volume would require an exclusive busway from State Route 238 all the way to Bay Fair Station and relocation of Elgin Street. The reconstruction of the transfer facilities at Bay Fair BART Station and the busway parallel to Elgin Street could cost $7 million.

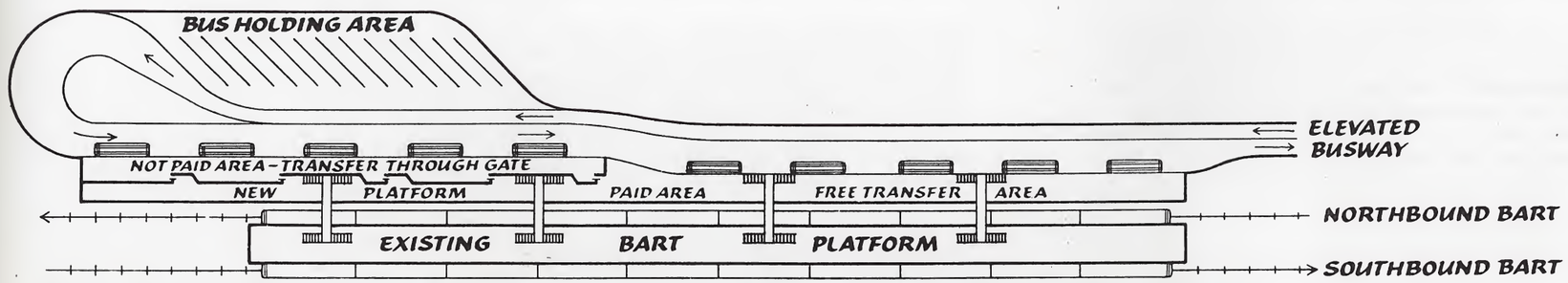
REJECTED ALTERNATIVES

I-580 Busway Alternatives

Alternatives that were studied include a one-way reversible busway, buses in mixed flow through Dublin Canyon, and various entry/exit procedures at both ends of the busway. In addition, the merits of retaining BART's Dublin park/ride lot, instead of acquiring the Dublin-Northwest Pleasanton Station site were analyzed. However, bus route alternatives were not analyzed in detail.



Section



Bay Fair Station High Capacity Bus-Rail Transfer Plan

One-Way Reversible Busway — In an effort to reduce construction costs, a one-way busway was evaluated. With this concept, buses would use the busway in the peak direction during the peak period. Travel in the off peak direction on I-580 would be in mixed flow. During commute hours, traffic will flow freely in the off peak direction on the freeway and on access ramps. A reversible, one-lane busway would reduce pavement width from that required for a two-lane bus roadway designed for high-speed travel in both directions by 14 feet (24 feet vs. 38 feet). However, if the busway were converted to BART rail, the embankment would have to be widened 10 feet, an awkward and costly operation, partially offsetting the initial cost savings. At bridge structures and the west busway exit structure, no savings would be realized by going to a one-way operation that would not be compatible with future BART rail. A 24 foot-wide one-way bus bridge could not accommodate two rail tracks. With two 14 foot travel lanes, this same bridge could accommodate a two-way busway.

In summary, the only savings realized would be in the at grade portion of the busway through Dublin Canyon. But the $2.5 million capital cost savings would be offset by higher operating costs, estimated at $100,000 annually. Remotely controlled barriers and signing would be required at all access points to the reversible busway, and it would have to be closed twice a day to allow operation to be reversed.

Reverse Bus Lane — Under this alternative, one freeway lane in the off peak direction would be dedicated to the exclusive use of buses traveling in the opposite direction. Sufficient capacity will exist in the off peak direction to maintain free flow conditions. However, this solution is expensive to maintain (setting up the reverse lane twice a day) and inherently less safe because there is no positive barrier between opposing traffic flows. Experience with similar operation on the Golden Gate Bridge indicates that the cost could be up to $300,000 per year.

West of Redwood Road it still would be necessary to construct an exclusive busway because of serious traffic congestion between the Mission Street/State Route 238 interchange and the Bay Fair Station. Buses would reach the busway via slip ramps located west of Redwood Road.

It would be very difficult for buses from Dublin and Pleasanton to enter the reverse bus lanes safely because they must weave across four to five freeway lanes, counting the truck climbing lane. The westbound weave is especially critical because part of it would occur on an upgrade, increasing the speed differential between autos and buses. Furthermore, this maneuver would be hampered by slowly moving trucks in the truck climbing lane. Livermore buses would have several miles of level freeway in which to weave. For safety it would be necessary to construct an access structure that could not be used for a BART rail extension from the I-580 median to Foothill Road for Pleasanton and Dublin buses.

West End Busway Access

Slip Ramps — The least costly plan would utilize slip ramps for the median lanes of I-580 to the bus roadway. During the evening peak, eastbound buses would operate from the BART Bay Fair Station via 1.6 miles of slow, signalized surface streets to the East 14th Street ramps leading to I-580. Buses would enter the freeway on-ramp and climb a 7 percent grade 700 feet long, often from a standing start. After merging with State Route 238, the buses would have to contend with a 3 percent adverse grade for 3,000 feet, after which buses must gain speed to cross three travel lanes and enter the median busway via the slip ramps. The problem of mixing normal traffic with slowly moving buses would be complicated by I-580 traffic merging from the right at the crest of the grade. Weaving of ramp traffic also would cross the path of buses beyond the 7 percent climb. Operation westbound in the morning peak would require the slip ramp to be located on a down grade one mile east of the East 14th Street off-ramp, so that weaving from the median across three lanes could be accomplished with some degree of safety. Bus movement also would be severely hampered by projected peak period traffic congestion. Because 120 buses per hour are anticipated in 1990, some platooning would be expected as groups of buses meet BART trains.

East 14th Street Bus Ramp — The second plan studied would provide access to the busway via a ramp dropping within the freeway median to East 14th Street. If operated as a single, reversible lane, this would eliminate the freeway weaving problems for traffic in the peak direction, but conflicts would remain in the off peak direction. Operation as a two-way ramp, with slip lanes from the median to the freeway at appropriate locations on I-580, would eliminate weaving of slowly moving buses in the vicinity of the I-580/State Route 238 interchange. As

with the first plan, there would be about 1.6 miles of relatively slow traffic running through signalized intersections between Bay Fair and the freeway. A bus-actuated traffic signal would be required at the intersection of East 14th Street and the ramp terminal. About 1,000 feet of tapered retaining walls would be needed along the length of the ramp. Neither the ramp nor the retaining walls could be used for a future BART rail extension. Finally, eastbound bus travel times would be adversely affected by the standing start, steep ramp grade, and 3 percent grade for the first three quarters of a mile on the bus roadway.

One-Way, Reversible Busway Access — The third plan considered would continue the one-way, reversible busway alternative to State Route 238 and through the access structure to Elgin Street. In the morning peak westbound buses and in the evening peak eastbound buses would use the busway between Elgin Street and the east busway access structure in Dublin. Buses traveling in the off peak direction would travel in mixed flow. All buses would use the same slow surface street route between Bay Fair Station and the East 14th Street ramps to State Route 238 described previously. This plan simplifies reversing the operation of the busway and eliminates the need for slip ramps to the busway in the vicinity of Redwood Road. This alternative is not compatible with a two-way busway through Dublin Canyon because off peak direction buses must leave the busway in Castro Valley and merge with freeway traffic.

If the busway is to be converted to BART rail at a later date, the access structure under the westbound State Route 238 freeway lanes would have to be reconstructed to make room for two-way rail operation, a costly undertaking. Significant portions of the retaining walls approaching the access structure also would have to be removed, which would disrupt freeway traffic during construction.

East End Busway Access

Slip Ramps — This plan would utilize slip ramps to adjacent freeway lanes for all buses entering and leaving the median bus roadway. Buses would have to cross four lanes of eastbound and five lanes of westbound freeway traffic when entering or leaving the median busway to and from the Foothill Road interchange ramps. The two miles of adverse 3 percent grade encountered by westbound buses immediately upon entering the freeway would create conflict between vehicles moving at various speeds. High-speed automobile traffic in the lanes nearest the median and slow-moving trucks in the righthand lane would hinder buses from entering the busway lane until they could reach auto speed. The westbound slip ramp would have to be located on the downgrade beyond the crest, more than two miles west of Foothill Road, but the eastbound slip ramp could be located nearer Foothill Road. The extremely heavy truck traffic on I-580 would create conflicts in lane use. Taken together, operational and safety problems make this plan unacceptable.

One-Way, Reversible Busway Access — This plan provides for a one-way, peak direction access structure at the east end of the busway. Buses from Livermore would move onto the busway via a slip ramp. The structure would have to be reconstructed to accommodate rail service if it were built only for one-way operation. Furthermore, this alternative is not compatible with a two-way busway through Dublin Canyon because off peak direction buses would have to leave and enter the two-way busway on a grade, an unsafe procedure. If compatibility with BART rail is not a consideration and the busway through Dublin Canyon is one-way and reversible, then a one-way reversible access structure is feasible.

Park/Ride Station Alternative

Dublin Station — With this alternative, the park/ride lot in Dublin, to be used for initial bus service to the Valley, would be retained for the 1990 express bus system. The capacity of the 720 car lot would have to be doubled to accommodate projected 1990 patronage. However, if the bus system ever is converted to rail, the entire site would have to be abandoned. An added drawback is poor access to the busway, which would result in increased out of direction travel for Pleasanton buses. The Dublin site has merit only if no busway access structure is built, no full Stoneridge Drive/I-580 interchange is built, and buses use the Foothill Road interchange, or if an access structure with a northern orientation is built. The Dublin station is at a logical site for interim use, but would not be part of a permanent bus or rail system.

SYSTEM PATRONAGE AND FLEET REQUIREMENTS

Analysis of RTTPP Task III patronage forecasts resulted in the following comparison of BART and bus patronage in Dublin Canyon in 1990. An additional 1,000 intra-Valley trips are forecast, resulting in a total of 1990 daily patronage for the Bus Alternative of 22,000.

TABLE 19. BART/BUS TRAVEL COMPARISONS, 1990
(Person trips through Dublin Canyon)

	Highway[a]	Transit	Total[a]	(Percent Transit)
Bus	107,000	21,000	128,000	(16.4)
BART	103,000	34,000	137,000	(24.8)

(a) Excludes through traffic on I-580, i.e., highway traffic through Dublin Canyon with origins east of Altamont Pass.

Source: BART; Regional Transit Travel Projections Project, Task III

The 1990 bus patronage is comparable to the current, daily passenger volume of 20,000 on Golden Gate Transit buses. Based on these projections, BART staff estimates that 174 fifty-passenger buses will be required in 1990 for the seven routes serving the Valley, with 157 operating during the peak period. The Express Bus Operating Plan, Table 20, shows the distribution of buses among the routes and the average peak and off peak headways.

TABLE 20. EXPRESS BUS OPERATING PLAN

	Headways (Minutes) Peak Period	Off Peak	Vehicle Requirements[a] Peak Period	Off Peak
Line V - Dublin/Pleasanton to Fremont	15	60	6	3
Line W - Dublin/Pleasanton to Walnut Creek	15	60	5	3
Line X - Livermore to Bay Fair	15	30	8	4
Line X-Short - Pleasanton to Bay Fair	2.4	--	33	--
Line Y - Livermore to Bay Fair	0.9	--	88	--
Line Y-LRL - Livermore to Bay Fair	5	--	16[b]	--
Line Z - Dublin/Pleasanton to Bay Fair	4.4	--	17	--
TOTAL			157	

(a) Assuming 90 percent availability, the total vehicle requirement is 174.

(b) This run is the return portion of the Y run, therefore, does not count in the total vehicle requirement.

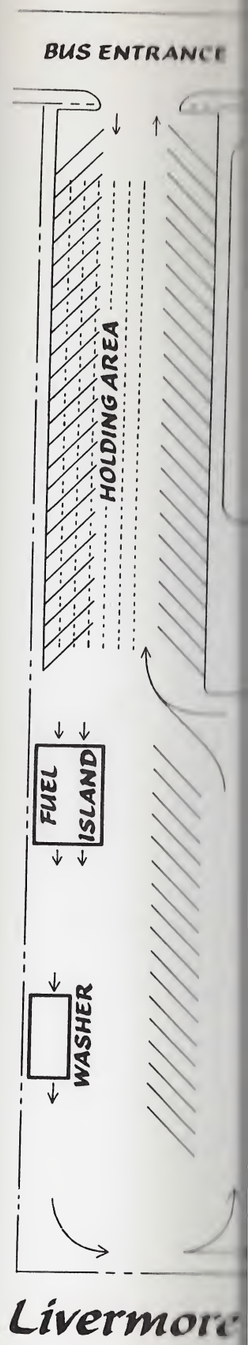
Source: BART

SUPPORT FACILITIES

Three separate maintenance and storage facilities would be required. With the exception of heavy maintenance, these support facilities would be operated independently. Heavy maintenance would be performed at AC Transit's Seminary Yard. Currently, AC Transit is operating one shift at the yard, and a second shift could accommodate the additional buses without expansion of facilities.

Bus Storage at Bay Fair — Because this commuter-oriented bus service will have high inbound patronage in the morning and outbound patronage in the evening, savings in mileage-related operating costs and diesel fuel would be possible with midday storage at Bay Fair Station. Of the 157 buses estimated to be in operation during the peak periods, about 10 buses would be required to maintain midday service on the Bay Fair-Livermore line and on the Walnut Creek-Fremont Line. Others would return to the operating base for scheduled inspections or repairs and to transport drivers back to the base. Consequently, storage for about 125 buses would be required near Bay Fair in 1990, which is comparable to the Golden Gate Transit 1.7 acre midday storage yard in downtown San Francisco with a 130 bus capacity.

Midday bus storage sites should offer direct access to the Bay Fair Station and should be on the route to the Livermore operating base to minimize lost time for drivers being returned to the base. A site area of three or more acres would be required if buses were to circulate within the site. (Golden Gate Transit buses circulate on adjacent streets.) Several potential sites with these characteristics exist around Bay Fair, but more detailed study would be necessary before the best one could be selected. Possible sites include AC Transit's Seminary Yard and drive-in theatres northeast of Bay Fair Station.

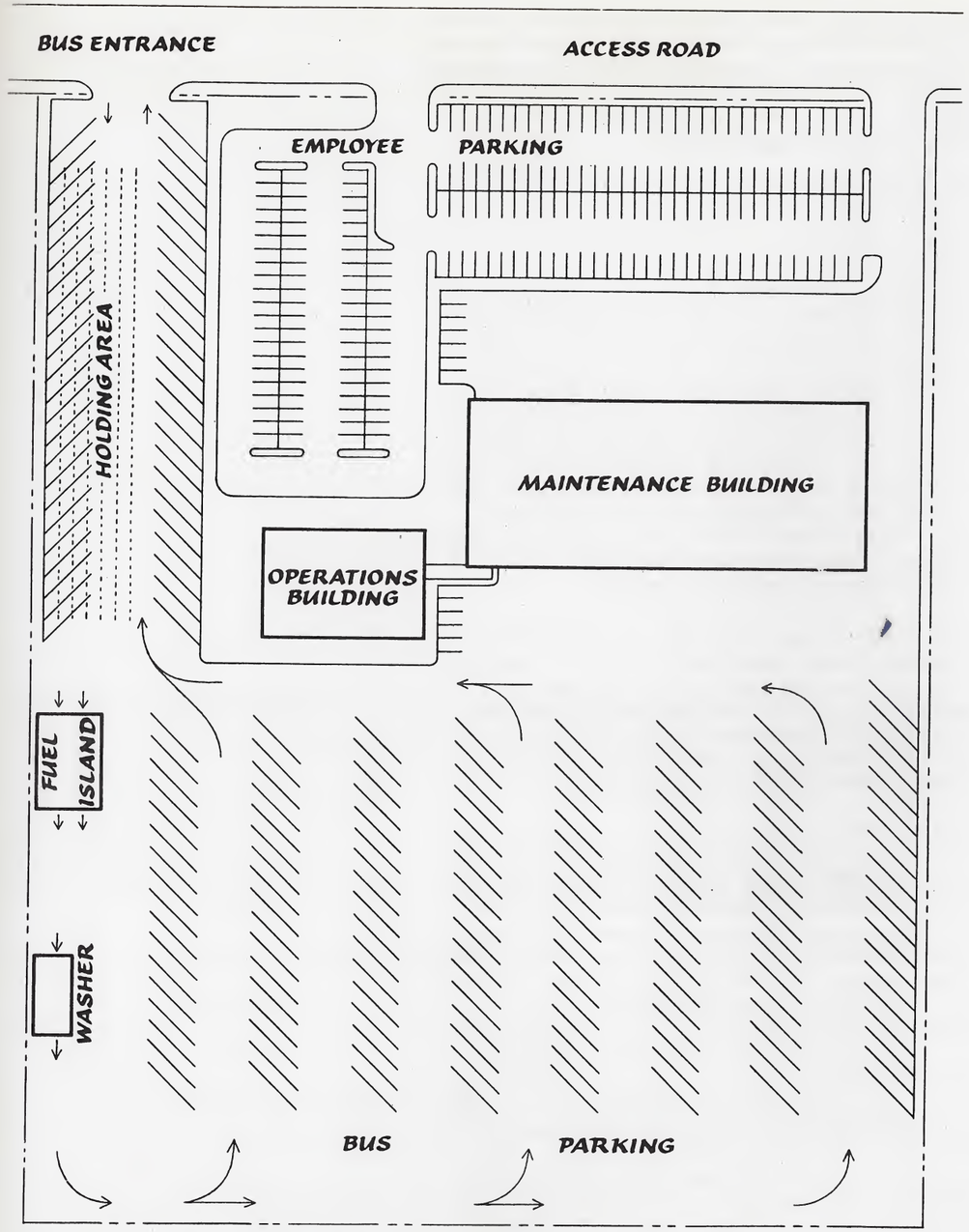


icle Requirements[a]

k Period	Off Peak
6	3
5	3
8	4
3	--
8	--
6[b]	--
7	--
7	

is 174.

t count in



Livermore Bus Yard Plan

Light Maintenance and Storage Yard — Light maintenance shops, a service area, and overnight parking for 174 buses would be located on six acres of the proposed BART yard site in east Livermore. These shops would house facilities for servicing, inspecting, and performing minor maintenance work such as lubrication, steam cleaning, and tire repair and would contain stock tool rooms, locker and ready rooms, and offices. The service area would consist of fueling and cleaning stations and working and cleaning facilities for the bus fleet. Non-vehicle maintenance functions for the busways and other fixed facilities also would be provided in the maintenance shop facilities. Central receiving and storage areas for all materials and supplies, including replacement parts, also would be provided.

A functional layout for the 1990 bus operating and maintenance base shown in the plan diagram would require about 13 acres. Parking stalls for 174 conventional 40 foot buses and a number of service vehicles are provided in the fenced and lighted yard. A 206 space employee parking lot would be needed by maintenance personnel and by drivers.

An individual bus stall arrangement would give access to any bus without moving others. Backing of buses into stalls is limited to the curbed perimeter of the yard. A "herringbone" parking arrangement uses less parking area but requires more time to park buses and increases the risk of striking already parked buses, unless curbing is provided. Parking buses in rows minimizes yard area, but makes individual buses inaccessible for maintenance or assignment to particular runs without special sorting procedures.

In the holding area adjacent to the yard entrance, buses could pull in and park in rows ahead of the fuel island. There, fare vaults would be removed, and servicemen would fuel, wash, and park the buses in stalls. The holding area is double-striped to facilitate parking the last buses.

The 125 by 300 foot maintenance building shown would accommodate all inspection and routine repair work for a fleet of up to 200 conventional buses. The facility would include parts and unit storage areas, building mechanical and electrical equipment, mechanics' washroom, lunch and locker areas, foremen's offices, a chassis cleaning room, inspection lanes, a chassis repair shop for repair and replace-

ment of mechanical components, and a minimal body and paint shop. The operations building houses the dispatching, supervision, and training functions as well as recreation, wash, locker, and lunch rooms.

A preliminary cost estimate for construction of the operating and maintenance facility is $4.1 million (1974 dollars). Additional allowances may be needed for landscaped buffer zones, sound barriers, or special treatment of drainage. The maintenance and service buildings are sized for conventional 40-foot buses. High capacity, articulated or double-deck buses would require larger and more costly buildings and equipment. However, storage area requirements might be reduced if fewer buses were needed.

FEEDER SERVICE

Local feeder service would be provided with both BART and bus alternatives. For analysis purposes, the local system is assumed to offer service within convenient walking distance of most Valley residents at no longer than hour intervals midday. Dial-a-ride bus service also might be available in certain areas. Routes and schedules would be coordinated so that service would be relatively direct and waiting times between BART trains or express buses and the local system would be minimal. Convenient intercommunity service within the Valley would be available, using BART or express buses for part of the total transit trip.

Express buses would not require as extensive a local bus feeder service as the BART alternative during peak periods because express buses also would operate as local collectors on arterial streets. A large number of commuters would be within convenient walking distance of direct one-seat service to the Bay Fair transfer point, particularly those living in high density developments near major arterial streets. The local bus system would supplement this service, its small buses providing local collection within the interior of residential areas and shuttling passengers to park/ride stations.

In the BART alternative, the local bus system would provide all local collection and feeder service to BART stations. Passenger loadings and frequency of service during peak periods would require more buses and drivers than necessary to provide the basic midday service. Larger buses also would be required. The cost of this added burden on the local bus system must be considered in evaluating the express bus and BART alternatives. During peak hours, the additional transfer required between feeder bus and BART trains make that feeder service somewhat less attractive than feeder service on express buses.

COSTS AND REVENUES

Capital Costs

The capital cost estimates for the Bus Alternative assume that the median of I-580 will be graded as part of the freeway widening project and will be able to accommodate two-way bus traffic as well as BART rail at a later date. With the exception of Bay Fair BART Station modifications, no design drawings of park/ride stations or transfer facilities were made. Construction costs for these facilities were estimated by comparison with similar stations elsewhere. The cost estimates are based on mid-1974 construction costs. Right of way estimates were prepared by BART staff using right of way requirements established by the consultant and furnished to BART.

Items of indirect cost were added to cover allowances for administration, design and construction engineering, construction supervision, and legal and financing costs. Due to the nature of the cost estimating data and preliminary nature of the design, a 25 percent contingency item was added to the sum of the direct and indirect construction cost.

Table 21 shows that the current cost of the Bus Alternative is about $80 million. This figure includes the cost of "buying into" the median of I-580 as well as almost $11 million for purchase of the required bus fleet. When comparing the total capital cost of BART rail vs. bus, one must consider the service life of the transit vehicles. Rail cars have an average life of 30 years, compared to 12 years for buses. Consequently, the entire bus fleet must be replaced twice over the life of a rail car. Assuming an escalation factor of 6 percent per year for the cost of buses, it will cost about $21 million to replace the fleet in 1986 and over $42 million to replace the same fleet again in 1998. Only half of this second replacement cost is included to arrive at a 30 year rolling stock replacement factor. Taking this into consideration, the total capital cost of the Bus Alternative for a thirty year service period is about $123 million, compared to $370 million for BART.

TABLE 21. CAPITAL COST OF THE BUS ALTERNATIVE (1974 Dollars)

Right of Way[a]	$ 13,000,000
Busway and Structures[a]	28,900,000
Park/Ride Stations[b]	10,300,000
Rolling Stock	10,500,000
TOTAL	$ 62,700,000
Design and Construction Engineering	7,800,000
Contingency	9,800,000
TOTAL	$ 80,300,000
Replacement of Rolling Stock[c]	42,400,000
TOTAL 30 Year Service	$123,700,000

(a) Includes allowance for reimbursement to CALTRANS for use of I-580 median.
(b) Includes bus yard in east Livermore.
(c) Includes replacement of bus fleet (12-year life) to cover estimated service life of rail transit cars (30 years) with a 6% annual escalation rate.

Source: De Leuw, Cather and Company; BART

Operating Costs and Revenues

BART staff estimates that with a 1990 daily patronage of 22,000 passenger trips (6.6 million annual) through Dublin Canyon it would cost $7.4 million per year (1974 dollars) or $1.12 per passenger trip to operate the express bus system. (See Table 22.) Assuming a bus fare structure of 30 cents for local trips, 35 cents from Livermore to the West Valley, 50 cents from the West Valley to Bay Fair BART Station, and 60 cents from Livermore to the Bay Fair BART Station, the revenue for the express bus system would be $3.4 million per year or $0.52 per passenger trip. The annual operating deficit then will be $4 million or $0.60 per passenger trip.

TABLE 22. 1990 PATRONAGE, OPERATING COSTS AND REVENUES OF THE BUS ALTERNATIVE (1974 Dollars)

Total Passenger Trips	
Daily	22,000
Annual	6,600,000
1990 Operating Costs[a]	
Annual	$7,400,000
Per Passenger Trip	$1.12
1990 Revenue Estimates[a]	
Annual	$3,400,000
Per Passenger Trip	$0.52
Projected 1990 Deficit[a]	
Annual	$4,000,000
Per Passenger Trip	$0.60

(a) For extension portion of trip only.

Source: BART

COMPARISON WITH BART

Costs

In order to compare capital and operating costs of the Bus Alternative with BART, two measures were calculated: total annual cost in 1990 and total cost per passenger-trip. In this way, tradeoffs between operating costs and capital costs can be seen clearly. Capital costs were annualized assuming 40 year bonds with 7 percent interest rate. A rolling stock replacement factor then was added based on the estimated service life of the bus fleet and the rail vehicles. The third factor in the equation is the 1990 annual operating deficit. The sum of these three separate costs, shown in Table 23, is the 1990 annual cost.

TABLE 23. 1990 ECONOMIC ANALYSIS, BART VS. BUS (1974 Dollars)

	BART	Bus
Capital Cost (without rolling stock)	$332,500,000	$69,800,000
Annual Debt Service (40 yr. bonds @ 7%)	24,940,000	5,235,000
Rolling Stock Replacement Factor[a]	1,200,000	875,000
Operating Cost	7,500,000	7,400,000
Total Annual Cost	$ 33,640,000	$13,510,000
Total Cost per Passenger-Trip	$3.09	$2.05
(Daily patronage)	(36,300)	(22,000)

(a) 1/30 of BART vehicle cost and 1/12 of bus cost based on expected life of vehicle.

Source: De Leuw, Cather and Company; BART

The Bus Alternative with a 1990 annual cost of $13.5 million would cost 60 percent less than the recommended BART route with a 1990 annual cost of $33.6 million.

A true comparison between these two transit systems should take into account the higher patronage expected with BART. But even then, the total cost per passenger-trip for the Bus Alternative using total daily patronage volumes is 34 percent below the comparable cost per passenger-trip for BART, $2.05 vs. $3.09.

In terms of operating deficits alone, BART is superior to the Bus Alternative. BART's annual operating deficit would be $1,100,000, one-fourth of the operating deficit forecast for the Bus Alternative. Operating deficits per passenger-trip are estimated to be $0.10 for BART and $0.60 for the Bus Alternative. This distinction is important because operating deficits are financed under different programs than capital expenditures, and matching requirements for federal and state funds are not the same, as will be seen in the section on financing in the Implementation chapter.

To place these costs in perspective, comparable costs for automobile travel to Bay Fair station were calculated. Only the distance between the park/ride stations or the BART stations and Bay Fair was considered in order to make the comparison fair. Automobile operating costs for freeway travel at an average speed of 55 miles per hour is $0.13 per mile (1974 dollars) including maintenance, tires, oil, gasoline, and depreciation, but excluding taxes, insurance, and parking. For arterial streets, vehicle operating costs range from $0.15 to $0.19 per mile. If the cost of driving an automobile to Bay Fair is $0.15 per mile, the trip to Bay Fair would cost the average Valley resident $2.66 ($2.22 per passenger at an average occupancy rate of 1.2). A trip from the Dublin-Northwest Pleasanton Station would be $1.90, and a trip from the West Livermore Station would be $3.20.

Total direct travel costs would be reduced more by BART than by the Bus Alternative because BART would carry more passengers. The RTTPP patronage forecasting model incorporates a travel cost minimization objective, so the patronage projections reflect a systematic comparison of travel times and costs for trips originating and terminating in the Valley. To compute separately an actual travel cost savings for each mode would have been a duplication of effort, yielding little additional information not implicit in the patronage forecast. Consequently, precise estimates of the change in travel costs attributable to BART and the Bus Alternative were not prepared.

TABLE 24. BUS ALTERNATIVE: ESTIMATED BART/EXPRESS BUS TRAVEL TIMES
(Minutes)

To \ From	Dublin-Northwest Pleasanton Park/Ride Station		Pleasanton Park/Ride Station	North Livermore Park/Ride Station		West Livermore Park/Ride Station	
Bay Fair	0.0[a] 0.0 19.2 19		0.0[a] 0.0 26.3 26	0.0[a] 0.0 25.9 26		0.0[a] 0.0 30.0 30	
Fremont	15.0 4.0 19.2 38	0.0 0.0 49.9[b] 50	15.0 4.0 26.3 45	15.0 4.0 25.9 45	0.0 0.0 59.9[b] 60	15.0 4.0 30.3 49	0.0 0.0 64.3[b] 64
Lake Merritt	13.0 4.0 19.2 36		13.0 4.0 26.3 43	13.0 4.0 25.9 43		13.0 4.0 30.3 47	
City Center (12th Street – Oakland)	15.0 5.5 19.2 40		15.0 5.5 26.3 47	15.0 5.5 25.9 46		15.0 5.5 30.3 51	
MacArthur	19.0 5.5 19.2 44		19.0 5.5 26.3 51	19.0 5.5 25.9 50		19.0 5.5 30.3 55	
Richmond	34.0 5.5 19.2 59		34.0 5.5 26.3 66	34.0 5.5 25.9 65		34.0 5.5 30.3 70	
Concord	45.0 5.5 19.2 70	10.0[d] 5.5 44.0[c] 60	45.0 5.5 26.3 77	45.0 5.5 25.9 76	10.0[d] 5.5 55.1[c] 71	45.0 5.5 30.3 81	10.0[d] 5.5 59.5[c] 75
Walnut Creek	38.0 5.5 19.2 63	0.0 0.0 43.7[c] 44	38.0 5.5 26.3 70	38.0 5.5 25.9 69	0.0 0.0 55.1[c] 55	38.0 5.5 30.3 74	0.0 0.0 59.5[c] 60
Rockridge	24.0 5.5 19.2 49		24.0 5.5 26.3 56	24.0 5.5 25.9 55		24.0 5.5 30.3 60	
Powell Street	26.0 5.5 19.2 51		26.0 5.5 26.3 58	26.0 5.5 25.9 57		26.0 5.5 30.3 62	

(a) 15.0 BART Main Line Travel Time (From Transfer Station to Destination)
4.0 Transfer Penalty
25.9 Express Bus Travel Time via I-580 Busway
45 Total Travel Time (rounded off to nearest minute)

(b) Express Bus Travel via Express Route X and Local Route V to Fremont BART Station

(c) Express Bus Travel Time via Express Route Y and Local Route W to Walnut Creek BART Station

(d) Includes transfer penalty at Walnut Creek BART Station

Source: De Leuw, Cather and Company

Travel Times

Express buses would provide a lower level of transit service than BART because travel on local streets and arterials and through freeway interchanges would increase travel times. Once the buses reach the I-580 busway, they would operate at 55 miles per hour, but still would not make up for lost time. This disadvantage obviously was the key factor that resulted in the lower patronage estimate for the Bus Alternative.

Travel times for the Bus Alternative to selected locations on the existing BART system, shown in Table 24, are comparable with travel times for the selected BART route in Table 11 (see page 51). The trip from the Dublin-Northwest Pleasanton Park/Ride Station to Oakland City Center, for example, would take 40 minutes with the Bus Alternative and 32 minutes with BART.

The average weighted travel time penalty for express buses in comparison to BART is 7.1 minutes per passenger-trip. The greatest penalty would occur at the Pleasanton Park/Ride Station, 14.1 minutes per passenger-trip, because of slow travel time on Bernal Avenue and Stoneridge Drive and at the I-680 freeway interchanges. Travel time penalties for the Dublin-Northwest Pleasanton Park/Ride Station and the West Livermore Park/Ride Station are 7 minutes and 8 minutes respectively, while the travel time penalty for the North Livermore Park/Ride Station is estimated at 1 minute, although it is not strictly comparable with the East Livermore BART Station. In fact, the North Livermore Park/Ride Station is in a slightly better position to intercept out-commuters, and this advantage is reflected in the lower travel time penalty.

Valley express bus patrons would spend about 2,700 hours more time traveling each day than with the BART alternative. Pleasanton out-commuters would account for close to three quarters of this additional time, while patrons of the North Livermore Park/Ride Station would suffer the least inconvenience. Consequently, Livermore residents might not give the travel time penalty as much weight in the BART vs. bus comparison as Pleasanton residents.

Three possibilities exist to reduce the Bus Alternative's additional running time to Bay Fair Station. If the 55 mile per hour federal speed limit did not apply to buses operating on an exclusive busway, bus travel times could be reduced by 2 minutes, assuming 65 miles per hour through Dublin Canyon. Special legislation for higher speeds on exclusive busways probably could be enacted quite easily. Buses also could operate at 55 miles per hour on Elgin Street south of Bay Fair Station, instead of 30 miles per hour, for a travel time savings of 2 minutes per trip. Finally, construction of a high capacity transfer facility at Bay Fair Station could reduce the transfer time by 0.5 minutes. With improved travel times, patronage for the Bus Alternative through Dublin Canyon undoubtably would be higher than the 1990 forecast of 21,000.

Suitablility to Serve Young, Old, Poor, and Disabled

From a regional perspective the BART extension and the Bus Alternative would offer about the same level of service to the young, old, poor, and disabled. During peak periods, neighborhood, one-seat service with the Bus Alternative would be viewed as a plus for the young, old, and partially disabled because it would eliminate a transfer in the Valley. On the other hand, express bus patrons would have to walk further at Bay Fair Station in the absence of a high-capacity bus-rail transfer facility which would be more inconvenient for those who have difficulty walking or require wheelchairs. BART cars can accommodate wheelchairs more easily than presently available buses, but expected improvements in bus design may overcome this drawback. Neither transit system is expected to confer different benefits on the young, old, and poor with improved accessibility to Valley jobs and services because park/ride stations would be built in essentially the same locations as BART stations. For detailed evaluations of the suitability of each Valley and corridor station to serve these interest groups, the reader should consult the tables in Appendix B.

Overall Service Comparison: BART vs. Bus

An important factor in the comparison of BART and express bus is the service characteristics of each system. Comfort, ease of transfer, speed, and frequency of service all have a bearing on transit ridership. Patronage forecasting models can incorporate only travel times and frequency of service, so ridership estimates derived from these models should be interpreted in light of actual service characteristics.

In terms of passenger amenities, BART's spacious interiors, comfortable seating, wide aisles, panoramic windows, and smooth ride make a BART car more appealing than a conventional bus. The large capacity of trains, platform level floors, and wide doors and aisles allow BART to handle larger volumes of passengers quickly and easily, without the delays normally encountered with express bus. At Bay Fair Station, the relatively convenient transfer from the Livermore extension to the Fremont Line would be superior to the bus transfer arrangement, because Valley BART patrons would have to walk a shorter distance than express bus passengers. However, a high capacity bus-rail transfer facility could be built at Bay Fair Station to offer the same ease of transfer as BART. Finally, the possibility of eventually offering a direct tie-in with the existing system would give BART an advantage over the Bus Alternative.

Express buses will not reach the high travel speeds of BART. In fact, rapid acceleration and high speed are important factors in attracting BART riders. Passengers perceive the train ride as distinctly superior to a non-stop express bus even though the travel time difference, considering intermediate stops, might not be great. However, express buses will be able to offer many Valley residents neighborhood one-seat service to Bay Fair Station during peak periods. Fleet requirements and local routing also can be adjusted more efficiently with the Bus Alternative to meet demand. Direct service, for example, from Bay Fair Station to the Lawrence Radiation Laboratory and other major activity centers could be instituted with the Bus Alternative, while BART patrons would have to change to a shuttle bus at the East Livermore Station. In the event of breakdowns, fewer people would be inconvenienced and delayed with the Bus Alternative than with BART. A decision between BART and bus would have to weigh the service characteristics against the costs and environmental impacts.

ENVIRONMENTAL IMPACT

In general, the environmental impacts of the Bus Alternative are not as great as those noted for BART because the express buses would operate on existing streets and arterials. Where the Bus Alternative requires construction, such as entry or exit structures in the I-580 median or park/ride stations, the direct environmental impacts are equivalent to those anticipated with the BART alternative because the facilities were designed to BART standards to permit eventual conversion to rail.

Urban Environment

Disruption and Displacement — A total of 63 housing units would have to be acquired for the Bus Alternative. Sixty-two of these are located between the Bay Fair Station and Route 238, and one lies south of the I-580 busway structure in northwest Pleasanton. In addition, two small businesses employing their proprietors would have to be acquired between the Bay Fair Station and Route 238. No displacement would occur at any of the park/ride stations in the Valley. Near Bay Fair Station, further displacement might result from the location of the daytime bus storage facility, but careful site selection could avoid this problem.

Noise — Express bus noise impacts were predicted using noise contours published in Noise Pollution by Clifford R. Bragdon (1971). Field measurements of bus noise taken at normal operating conditions (25 miles per hour) along city streets indicate noise levels of 72 dbA at 50 feet. However, when buses are accelerating, noise levels at 50 feet increase to 85 dbA. Using the National Cooperative Highway Research Program noise standards, housing within 550 feet of an accelerating bus and 115 feet of a bus traveling at 25 miles per hour would be subject to moderate noise impact (0-5 dbA over the standard). Major noise impacts (over 5 dbA over the standard) would occur within 300 feet of an accelerating bus and 60 feet of a normally operating bus.

In the Valley, over 42,000 lineal feet of projected 1990 urban land use would be exposed to moderate noise impacts, and almost 43,000 feet to major noise impacts. Table 25 summarizes the Valley express bus noise impact for existing and projected land use.

TABLE 25. VALLEY EXPRESS BUS NOISE IMPACT[a]

Existing 1972 Land Use[a]		Projected 1990 Land Use[a]	
Moderate Impact 0-5 dbA	Major Impact over 5 dbA	Moderate Impact 0-5 dbA	Major Impact over 5 dbA
29,800	36,400	42,300	42,700

(a) Lineal feet of land use adjacent to an express bus route.

Source: Livingston and Blayney

Visual Quality and Physical Fit — The visual character of the Valley would not be changed in any major way by the Bus Alternative which, by its very nature, is one of the least obtrusive transit systems. During morning and evening commute hours, express buses providing local feeder service would be seen on neighborhood streets every four to six minutes in Livermore and Pleasanton, hardly a major visual impact especially if local auto traffic decreases. Between Bay Fair and each of the Valley park/ride stations, the express buses would use major arterials or freeways and thus would blend into the highway environment. Effective use of color in design of bus exteriors can have quite pleasing effects, in addition to the more obvious value of increased market appeal.

As with BART, the parking lots will be rather unattractive even with landscaping. However, the absence of large aerial structures would make the Dublin-Northwest Pleasanton Park/Ride Station, for example, less obtrusive than a BART Station on that site.

The riders' visual experience on buses would be superior to driving in an automobile because larger, higher windows would offer broader vistas. In comparing bus with BART, it would probably be a toss-up, except along aerial segments of the selected route where BART would offer pleasing panoramas of the hills and the Valley floor.

Growth-inducing Impact — Because fewer people would use buses than would use BART, the growth-inducing impact would be less than that estimated for BART. With work trip patronage for the Bus Alternative about 25 percent below estimated BART patronage, the maximum total population impact would be around 9,500 people, assuming as a reasonable upper limit that no more than one out of every four bus patrons would not have lived in the Valley if rapid transit service were not available.

Regional and Valley Development Impact — Insofar as the Bus Alternative would improve accessibility to and from the Valley, its regional development impact would be similar to BART's, although not as great because ridership would be lower. In the Valley, rapid transit-oriented development could occur around the North and West Livermore Park/Ride Stations, but the market appeal would not be as great. The travel time penalty, especially in Pleasanton, coupled with the option of riding a feeder bus straight through to the Bay Fair Station would reduce the advantages of housing next to a park/ride station.

The Bus Alternative would have no development impact on Castro Valley, obviously, because no park/ride station would be built there. Castro Valley residents would not suffer from displacement to accommodate transit facilities or transit-induced redevelopment, although they would have to use feeder buses or drive to Bay Fair Station and contend with increased congestion to ride BART.

As with the BART alternative, local expenditures for retail goods and services might increase if bus patrons spend a portion of their travel cost savings in the Valley. Because the Valley fares are assumed to be equal for BART and the Bus Alternative, the savings in travel cost for each trip would be the same. However, with lower 1990 patronage, the Bus Alternative would generate only about $14 million annually in travel cost savings for Valley express bus patrons.

Local Government Costs — The Bus Alternative would not have as positive an impact on local government costs as BART would. The major difference lies in the railroad consolidation and grade separation project costs. Under the Bus Alternative, Pleasanton and Livermore would have to assume their share of the projects' costs if they wanted to have them completed. The savings resulting from compaction are not expected to be as great with the Bus Alternative because less transit-oriented development at higher than "normal" densities is expected. Finally, the favorable impact on local street maintenance costs would be less with the Bus Alternative because of lower patronage, but the difference probably is not significant. The increased bus mileage on local streets would make local maintenance costs higher than for BART.

Historical and Archaeological Sites — The only historical sites that could be affected by the Bus Alternative are near the North Livermore Park/Ride Station. Transit-oriented development could threaten the Alexander Eden home. The site of the Livermore Adobe, which is no longer standing, would be covered by the parking lot, but excavation and salvage operations could be conducted during construction.

Natural Environment

Except for air quality, the Bus Alternative would have minimal impact on the natural environment. The proposed park/ride stations would not affect local water resources, drainage patterns, or any other valuable ecological resource. Around the North Livermore Park/Ride Station, sensitive planning might enhance the recreational use of the surrounding area, particularly the gravel pit area and the Arroyo Las Positas.

Air Quality — The Bus Alternative would reduce vehicle miles of travel by 300,000 each day vs. 482,000 for BART, assuming an average trip length of 17 miles for express bus patrons and an auto occupancy factor of 1.2. Using the Air Resources Board's emissions factors corrected for speed of travel, express buses would generate 0.05 tons of hydrocarbons per day, and the net reduction in hydrocarbon emissions would be 0.25 tons per day, about 7 percent of CALTRANS hydrocarbon emission forecast for 1990 without rapid transit through Dublin Canyon. BART would achieve a 14 percent reduction. The reductions in carbon monoxide and oxides of nitrogen emissions would be proportional to those indicated for hydrocarbons. The Bus Alternative also would reduce the number of "cold starts" each day by about 6,700 as opposed to 9,100 for BART.

However, because the Bus Alternative would have a lower growth-inducing impact and could be in service 2 to 3 years earlier than BART, the long-term air quality impacts may be more favorable than the numbers above suggest.

Energy Requirements — The energy demands of the Bus Alternative were calculated using fuel consumption values for 50 passenger buses operating on exclusive busways and on local streets in collection/ distribution modes published in the U.S. Department of Transportation Characteristics of Urban Transportation Systems handbook (1974). Bus energy consumption is estimated at 470 BTU's per passenger-mile, about 60 percent below BART's consumption, using an 80 percent load factor derived from the patronage, fleet requirements, and headways for the system. Average gasoline consumption is estimated at 0.140 gallons per vehicle-mile, assuming an average vehicle speed of 45 miles per hour and average roadway grades of 2 percent over one quarter the trip. Consequently, for every automobile trip diverted to express bus, close to 8,200 BTU's per passenger-mile would be saved. If 1990 Valley bus patrons drove to Bay Fair, annual energy consumption would be the equivalent of about 150,000 barrels of oil, 60,000 barrels of oil less than the BART savings primarily because of the lower bus patronage forecast.

Open Space — The Bus Alternative's impact on open space is not likely to be as great as BART's simply because less transit-oriented development is expected around park/ride stations. Furthermore, feeder bus systems offering through service to Bay Fair Station will be able to serve outlying residential developments easily, so the incentive for compaction would have to come from other governmental programs. Compact planned unit developments could be designed around a central pickup point, but the bus lacks the positive image of a BART station area.

However, the Bus Alternative's significantly lower 1990 annual cost, $15 million, conceivably could result in more public funds for open space preservation programs. If only a portion of the annual cost "savings" were available for other public purposes, the impact of the Bus Alternative on the environment might be greater than that anticipated with BART. It should be recognized, though, that this comparison assumes that public funds not spent on rapid transit in the Valley would remain available to support other Valley programs. If the BART extension were financed primarily with federal grants, Highway Trust Fund monies, and State gas tax revenues, this option would not be available. However, if other financing mechanisms were used, presumably the revenue generating capability not allocated to the BART extension could be put to other uses by communities in the Valley.

IMPLEMENTATION

The principal elements of a BART Extension Implementation Plan are financing alternatives and opportunities for local development and transit service coordination with the BART extension. For this report, the BART staff has identified the principal sources of funds and the major issues associated with financing the Livermore-Pleasanton BART Extension. Independent studies of transit financing were not conducted by the consultant.

Local regulatory measures could encourage development that would complement BART and could take advantage of rapid transit's impact on development patterns. Local financing mechanisms and state and federal aid programs that would have a bearing on the economic feasibility of various development proposals are discussed. Early acquisition needs and the requirements for staging of public improvements also are described. However, it should be stressed that only when all of the regional corridor transportation studies have been completed and reviewed and the full range of implementation requirements is known, will it be possible for BART and MTC to prepare a comprehensive implementation and financing program balancing regional priorities and local needs.

FINANCING

Capital costs and operating costs must be considered separately when evaluating alternative methods of transit financing. While capital costs generally are a one-time expenditure, operating costs continue as long as the system functions and, consequently, are subject to inflation. The estimated capital cost of the Livermore-Pleasanton BART extension is $370 million, and the 1990 annual operating cost is $7 million (1974 dollars). In 1990, fare revenue is expected to cover about 90 percent of this cost, leaving about $800,000 to be financed by an annual operating subsidy.

Since transit operation ceased being profitable shortly after World War II, deficits have been met from a broad and changing range of sources. The current transit financing picture is unclear and may be described as a transition period in which a long-term arrangement is being sought. In contrast, the highway program for years has had clear, predictable sources of revenues for new construction.

Gauging financing possibilities for a Livermore-Pleasanton BART extension involves looking first at funding programs and then at the decision-making process that guides the use of these funds. Decisions on BART extensions will be made within a regional context, balancing transit needs with resources. This process, like transit financing, is evolving towards an established procedure, but it has not yet reached that state.

Three sources of funds for transit construction and operation exist: federal, state, and local. Federal funding programs invariably have to be combined with state and/or local sources of funds to finance a transit system.

Federal Programs

Urban Mass Transit Aid — Under the National Mass Transportation Assistance Act of 1974, increased federal assistance is authorized under a capital grant and formula grant program, and the life of these programs is expanded from two to six years. The capital grants program will provide $7.8 billion over the next six years. Under the urban mass transit (formula grant) program, an additional $4 billion is authorized over the next six years for financing capital projects or paying operating costs. For capital grants, up to 80 percent of the project cost can be covered by federal grants, while federal funding for operating subsidies is limited to 50 percent. The allocation formula for capital grants and operating subsidies is based on 1970 population and population density.

Federal Aid Highway Funds — BART is building three transit fringe parking facilities using 90 percent federal Interstate Highway funds. BART also has other projects proposed for financing by Federal Aid Urban (FAU) highway funds under a 1973 provision of the Federal Highway Act that makes funds available for both urban highways and transit (including rolling stock), nominally on a 70 percent federal and 30 percent local basis (actual ratio is close to 83 and 17 percent). These funds conceivably could pay for 70 percent of the cost of street and traffic control improvements related to transit.

The amount of federal funds available for transit projects falls far short of the estimated needs of America's urban areas, so choices will have to be made. Not only will these decisions contrast projects in alternative metropolitan areas, but alternative solutions within each area will have to be evaluated. As a consequence, some communities will have to assume more than 20 percent of a transit project's cost if they are to proceed with their desired system.

State and Local Financing

Property Taxes — This is the major source of funds used by the San Francisco Municipal Railway and AC Transit. BART construction was financed partially by a $792 million bond issue that is being retired by property tax revenues. Because voters are increasingly reluctant to approve general obligation bonds for major public projects, property taxes are an unlikely source of capital funding, particularly for BART extensions within the existing BART District.

Sales Tax — Currently, BART is paying off a $150 million dollar construction bond issue with revenues from a special one-half cent sales tax levied within the BART District. Although these bonds will be redeemed in 1975, the sales tax will continue as a source of BART operating funds until 1977. However, it is uncertain whether sales taxes still will be a funding resource when a Livermore-Pleasanton extension would be built. MTC has recommended that the State pass enabling legislation to permit counties to authorize up to a one cent increase in sales tax that would be allocated for transit.

Transportation Development Act Funds — The California Transportation Development Act (Mills-Alquist-Deddeh Act) of 1971 makes one quarter cent of the current sales tax available for local transportation needs. Funds are allocated by MTC, but are restricted to use in the county of origin. In the Bay Area all of the transit agencies currently are using these funds for both capital and operating costs, especially for small capital projects and purchase of buses. Pressure to cover operating expenses for existing transit systems probably would override efforts to allocate these funds solely to major projects.

Bridge Tolls — The Golden Gate Bridge, Highway, and Transportation District is using bridge tolls to finance the local share of the capital costs and the operating deficit of its bus and ferry system. Funds from the three San Francisco Bay bridges (San Francisco-Oakland, San Mateo-Hayward, and Dumbarton) were pledged to support BART's bay tube. In its Regional Transportation Plan, MTC's position is to continue "its present efforts to secure legislative authorization to use surplus bridge toll revenues for transit purposes on an equitable basis."

State Proposition 5 Funds — With passage of a 1974 California Constitutional Amendment known as Proposition 5, State highway funds now can be spent for planning, construction, maintenance, and improvement of fixed guideway transit facilities. Up to 25 percent of the State highway funds available within a county can be used for transit. Within Alameda County, the maximum amount available for diversion will be about $9 million per year. Whether these funds could be used to pay for exclusive bus lanes has not been determined.

Trends in Financing

At both national and local levels present transit financing involves not only different sources but shifting relationships among these sources over time. Recently, the trend has been towards increasing funds for transit. However, programs such as Proposition 5 and the Federal Highway Act permit choices between highways and transit on a project by project basis. With this approach, it is impossible to anticipate how much money will be available for transit projects in the foreseeable future.

Although expected funds cannot be forecast accurately, transit projects have a better chance for funding than in the past. Now that highway funds can be allocated to transit, the Bay Area has more latitude to choose among transportation programs. As a consequence, the regional transportation planning process will play an increasingly important role in setting priorities in response to local needs.

Programming Transit Improvements

MTC is responsible for the preparation of a Regional Transportation Plan that includes both highway and transit improvements. The Livermore-Pleasanton BART Extension Study is one component of this large scale effort, and will be used by MTC and BART to establish priorities and develop a comprehensive plan for the expansion of transit services.

Upon completion of this extension study, responsibility for project implementation will shift to those agencies that can fund and construct a BART extension. MTC must evaluate the Livermore-Pleasanton BART extension in relation to other possible projects throughout the region and alternative regional transit modes and levels of investment within the Livermore-Pleasanton area. This evaluation will be a cooperative effort among MTC, BART, and Valley communities, with the objective of incorporating the extension in MTC's Regional Transportation Plan. Even if the extension is included in MTC's Regional Transportation Plan 10 year estimate of regional needs, funding is not necessarily ensured for the project because transit needs consistently exceed available funds. Regional priorities will be set by MTC. Responsibility for securing funds will rest primarily with BART.

Existing tax levies allocated to BART are committed to paying for the initial system and its operation, including express bus service to outlying areas. Consequently, extension of the BART system will require additional sources of funds for capital and operating costs.

Comparison of the Livermore-Pleasanton BART extension with other projects throughout the region raises equity issues because local taxpayers in the three county BART District have supported over 80 percent of the cost of the BART system. Proposed extensions outside the three county district could provide a partial source of new capital funds for extensions within the BART District. The existing BART Act indicates that taxpayers in a county that joins the system would have to share some of the costs of the present BART system, but the exact amount would be subject to negotiation. For a discussion of these issues, readers should refer to the San Francisco Airport Access Project Final Report by Parsons-Brinckerhoff-Tudor-Bechtel, Wilbur Smith, and Kirker, Chapman and Associates, October 1972.

According to the BART Act (Part 2, Division 10, Public Utilities Code), if a BART extension were built into San Mateo County, the County would have to assume about 22 percent of the cost of the regional BART system, including the cost of the extension. Because federal funds would be available to pay up to 80 percent of the extension project cost, a surplus could be available to construct additional projects within the BART District or to lower existing BART taxes.

In summary, although existing funding sources will not be adequate to meet all transit needs in the Bay Area, transit financing programs are evolving, and today's limitations may be overcome in the future. At both the national and local levels, the principal "change agent" will be the regional, multi-modal planning process to which BART and MTC are committed. This planning process will be the critical factor in a decision on whether or not to build the Livermore-Pleasanton BART Extension. BART and MTC will arrive at a final decision after careful review of the planning information developed in this study, preferences of the people living in the Valley, and the magnitude and urgency of transit needs elsewhere in the region. Once a priority has been established for financing extension of BART service to the Valley, mechanisms will be analyzed, and possibly new sources will be required if existing programs prove inadequate. In any event, current trends in transportation financing indicate that the Valley and the San Francisco Bay Area will have increasing influence over how all transportation dollars are allocated.

LOCAL DEVELOPMENT COORDINATION WITH BART EXTENSION

The key to local development coordination with BART is the ability and desire of local governments to plan for development near the stations. The overall rapid transit/community development concept that has evolved during the Livermore-Pleasanton BART Extension Study stresses opportunities for intensive development around stations. Each station area presents unique opportunities for coordinated development that will allow the most people to benefit from proximity to a regional rapid transit system. In certain instances, local governments may have to offer additional incentives, pre-cleared land for example, to gain the maximum amount of BART-oriented development. Proposed land uses shown on the schematic station plans do not represent a significant departure from anticipated trends and are consistent with local general plans.

Regulatory Measures and Sources of Financing

The benefits of coordination between private development and the proposed BART extension can be achieved if local governments use planning and land use regulation to reinforce the proposed rapid transit/community development concept. Adopted plans and policies conform to the proposed concept, and local governments should take a strong position

against any modification or amendment of these plans and policies that directly or indirectly would pose a conflict with the proposed BART extension.

The following sections treat each local regulatory measure and development program separately in relation to the need for local development coordination with the BART extension.

General Plans, Specific Plans, and Zoning — The adopted city and county general plans are used as guides to the future development likely to occur around stations and in each community. Since 1973, State law requires zoning to be consistent with the general plan, so only development proposals that conform to the planned uses would be permitted. However, the level of detail at which most general plans are prepared often is not adequate for development planning. To remedy this, State planning law authorizes local governments to prepare specific plans to facilitate implementation of the general plan. Accordingly, it is recommended that each community prepare a specific plan for the area surrounding each BART station in order to refine the proposed rapid transit/community development concept. Each station area plan should include an implementation program that specifies what should be done to insure proper staging of public improvements. The specific requirements for staging of public improvements are described at the end of this chapter.

Specific plans are authorized under Section 65451 of the California Government Code to include the following:

(a) Regulations limiting the location of buildings and other improvements with respect to existing or planned rights of way.

(b) Regulations of the use of lands and buildings, the height and bulk of buildings, and the open spaces around buildings.

(f) Such other measures as may be required to ensure the execution of the general plan.

In addition, development proposals within station areas can be subject to design review to insure conformity with the specific plan and to allow for evaluation of innovative alternatives to the uses shown on the plan. In this way, communities will not discourage private development in a station area that might be compatible with the rapid transit/community development concepts. The specific plans also could include dedication requirements for designated pedestrian and bicycle lanes to ensure improved access to the station area.

Community Redevelopment Law — Under a reasonably liberal reading of the California Community Redevelopment Law any of the proposed station areas on the selected route, with the possible exception of East Livermore, could become a redevelopment area. The rationale would be that built up portions are characterized by building obsolesence or poor layout and open portions "require replanning and land assembly for reclamation or development in the interest of the general welfare..." At all of the station sites the best site plan for the BART station and the impact area must disregard existing ownership boundaries. Although a need for large scale acquisition beyond the station sites is not anticipated, only an agency with the power and money to acquire realistically can hope to optimize development. Even if there were no intent to regulate beyond the normal limits of zoning and subdivision controls, use of the redevelopment law would lighten the financial burden on the cities or County. Under the law the property taxes collected on increases in assessed valuation after a redevelopment area is established may be used to defray redevelopment costs. Since BART would be expected to cause sharp gains in value, the tax increment available to finance street improvements, buy and improve public open space, or write down land costs for moderately priced housing would be significant. Federal Community Development Grants could be used to aid low or moderate income housing.

The City of Pleasanton has created a redevelopment agency and is proposing a project that would encompass all of the downtown (including the portion of the Pleasanton BART Station area within the City boundary) connected by a narrow corridor to the site of Stoneridge Regional Shopping Center, including most of the Dublin-Northwest Pleasanton Station impact area. The political justification for this boundary is that because competition from the new shopping center will create the need for large public expenditures in the downtown area, the new taxes generated at Stoneridge should be allocated to downtown renewal. If this project proceeds, both Pleasanton BART station areas could benefit.

In Castro Valley, the street and lot pattern adjoining the station site are ill-suited to BART-related development, and there are incompatible mixtures of uses and some obsolesence. Alameda County does not have a redevelopment agency, but is authorized by State law to create one.

Parking Policies — One approach to coordinating local development with BART and encouraging greater transit usage is through parking policies. Instead of the usual specification of the minimum amount of parking to be provided, development regulations could leave the decision to the builder or could set an upper limit on the private off-street amount of parking within 1,500 feet or one-half mile of BART stations. In this way, people living and working near stations would be encouraged to rely more on transit than on the private automobile, transit-oriented development would be encouraged, and open space would be conserved. Recent federal Environmental Protection Agency regulations calling for parking management plans in the San Francisco Air Basin suggest such approaches to achieve and maintain adopted air quality standards. Close coordination of parking management programs with local feeder bus service and on-street parking time limits would be essential.

Housing Policies — Local governments could encourage construction of townhouses and garden apartments around BART stations to maximize walk-in patronage. The opinion survey conducted as part of this study showed that a majority of Valley residents would prefer that any population increase be housed in single family dwellings. But if the proportion of multi-family units inevitably will increase because of rising housing costs, concentration of higher density development around BART stations may be more acceptable than dispersion over a larger area. Certainly, the reduction of vehicle miles of travel resulting from concentrating as many people as possible near BART would be welcomed.

The obvious strategy to achieve this pattern would be to zone land near the stations for multi-family housing and curtail such zoning elsewhere in the community. This will work only if sufficient high density acreage is designated to avoid inflating land prices near BART stations so as to cause nearby housing to be substantially more costly than units built elsewhere in the community. Although 31 percent of the opinion survey respondents would be willing to pay more to live within walking distance of a station, the adverse impact of land speculation cannot be ignored.

Assessment Districts — Where public improvements, particularly streets and utilities, will benefit a group of property owners, an assessment district apportioning the cost according to benefit received is a commonly used device. In the vicinity of BART stations rising property values create an ability to pay assessments, but the local government must ensure a willingness to participate by withholding development approval until installation of improvements is ensured.

Excess Condemnation — Excess condemnation by BART could ensure BART-oriented development and would recapture some of the "windfalls" in station area property values. Excess condemnation occurs when BART acquires more right of way than is actually needed for transit, usually to avoid high severance costs that would have to be paid to a property owner if the opportunity to use or develop the remaining portion of his land is impaired. BART could specify the type of development desired and sell or lease excess land to developers or to redevelopment agencies or housing authorities.

When severance costs are not an issue in securing rights of way, a public agency is limited by State law from acquiring more than 150 feet of land beyond the boundaries of the proposed project for environmental protection purposes. Excess condemnation to recoup windfalls due to increases in adjacent property values has not been recognized explicitly by California law as a proper function of a public agency.

Federal and State Aid Programs — Community development block grants are authorized by the federal Housing and Community Development Act of 1974. Programs that were consolidated under this Act include urban renewal, model cities, neighborhood facilities, open space, urban beautification, historic preservation, and water and sewer and public facility loans. Priority must be given to activities that will benefit low or moderate income families or aid in the prevention or elimination of slums or blight. Federal lower income housing assistance programs could be used to encourage construction of low and moderate income housing within station areas and to provide direct cash assistance to eligible households. However, the funds likely to be available under these programs cannot be forecast with any accuracy, so it is impossible to indicate how significant federal assistance would be in encouraging BART-oriented station area housing development. Furthermore, local governments may decide that projects in other areas of the community are more worthy of support.

At present, no State programs have been instituted that would provide assistance for BART-oriented station area development. If a State housing finance agency were created in California, funds might be available to assist construction of low and moderate income housing close to BART stations.

Station by Station Analysis

Dublin-Northwest Pleasanton Station — Staging of development around the station area and early acquisition of the station site represent two opportunities for development coordination with the BART extension. The first step would be to reserve the right of way for the selected BART alignment through the proposed development. Because apartments and commercial uses near the proposed BART station could benefit from the improved accessibility offered by rapid transit, it might be possible to devote less space to parking for those working or residing near BART. Present plans for the Stoneridge Center call for the provision of parking in accord with accepted shopping center standards and do not take into account changes in travel habits that might result with a BART station.

The City of Pleasanton should consider abolishing minimum parking requirements and possibly imposing a maximum limit on parking space within 1,500 feet and one-half mile of the proposed BART station to encourage transit ridership and transit-oriented development and to conserve open space.

Transit feeder service to BART would alleviate the problem of congestion on Foothill Road north of I-580, where 1995 traffic forecasts indicate about 60,000 vehicles per day. A full interchange at Stoneridge Drive and I-680 should be built in advance of completion of the BART extension. Other opportunities for improved access could be realized if a convenient pedestrianway were constructed between the station and the shopping mall and if bikelanes and a bus access roadway for transit service to the shopping center became an integral part of the Stoneridge Center circulation plan, as proposed on the station plan (page 44).

Pleasanton Station — Plans for office and apartment development and redevelopment along Bernal Avenue and east of the Civic Center identified in the City's Central Business District Revitalization Plan should be coordinated with the BART extension to take maximum advantage of the improved accessibility BART would offer. The City of Pleasanton presently has created a Redevelopment Agency to implement the Revitalization Plan.

Proposals for expansion of parking at the Alameda County Fairgrounds in conjunction with development of a year-round amusement and recreation center should be reviewed using new transit service assumptions. The feasibility of a people-mover between the BART station and the fairgrounds also should be explored.

Plans for Bernal Avenue to pass under the railroad tracks should provide for cyclists and pedestrians. The City of Pleasanton should give the extension of Bernal Avenue east connecting with Pico Avenue high priority because of the reduced auto traffic that would result in downtown, and should consider setting of maximum parking standards within 1,500 feet and one-half mile of the Pleasanton BART station.

West Livermore — The need for coordination of the present railroad consolidation project with a BART extension is discussed in the section on staging of public improvements. Expansion of medical offices and related uses expected south of Stanley Boulevard could be designated with less parking and direct pedestrian access to BART. Multi-family housing also could be included in this area. Because all-day parkers could use neighborhood streets to the north and walk through the underpass to the station, parking restrictions may have to be imposed on El Rancho Drive and Albatross Avenue. The Murrieta underpass should be built with provisions for pedestrians and cyclists.

East Livermore Station — Full development of the station area in accord with the current general plan could place 2,000 jobs within walking distance of BART. Feeder buses to the station could carry employees working at nearby industrial plants as well as BART patrons. Without an adequate local feeder system, parking demand may exceed the station's planned capacity, and spillover could create congestion and parking conflicts on adjacent streets. Because 1995 traffic volumes are expected to reach 37,000 vehicles per day on First Street, spillover would compound peak hour congestion. To improve access for all BART patrons, the Mines Road railroad underpass should be designed to accommodate pedestrians and cyclists coming from the residential neighborhoods to the south.

STAGING OF BART AND PUBLIC IMPROVEMENTS

Federal acceptance of the I-580 Environmental Impact Statement and MTC and State Highway Commission approval of the I-580 freeway project in late 1974 allows possible staging of a BART extension to the Valley to be defined. The three phase I-580 reconstruction project currently is planned to be complete by 1980, with Phase One construction slated to begin in mid-1975. Under this schedule, BART could be operating trains to Livermore by 1982/83 if a decision

Two different approaches to staging of construction of a BART extension are feasible. One alternative would be to build the extension from west to east, beginning at the Bay Fair Station. However, the I-580 median would be occupied by unused track and would not be available for bus service while the Valley line segments are completed. Interim BART service from Bay Fair to Dublin would create maintenance and vehicle storage problems for BART and probably traffic congestion at the Dublin-Northwest Pleasanton Station. A more efficient solution would be to construct the extension in segments beginning at the Livermore yard and working west. Construction of Valley lines could take three to five years, while completion of the final segment of the I-580 median should require no more than six months if the busway already is in place and one to two years if no busway has been built. This approach minimizes disruption and allows the I-580 median to be used for interim bus service from 1980, at the earliest, until the Valley segment of the BART extension is finished.

A number of highway construction projects and railroad consolidation projects should be planned to accommodate interim bus service and, ultimately, BART rail service to the Valley. In the following sections, each project is analyzed in relation to the BART extension and changes are recommended, where necessary, to insure compatibility and proper staging and to avoid costly reconstruction. Coordination of construction of public improvements with interim bus service to the Valley also is discussed. Finally, early acquisition needs and local and regional transit service coordination with a BART extension are examined.

Future Highway Construction

State Route 238 — 1995 CALTRANS traffic projections indicate that State Route 238, west of I-580, and State Route 17 in the vicinity of Route 238 interchange will be operating at capacity during peak periods. I-580 (MacArthur Freeway) north of State Route 238 and the proposed Route 238 Freeway south of I-580 through Hayward also are expected to be utilized fully during peak hours. Congestion will be caused primarily by a lane imbalance in the freeway system in Hayward, where more freeway lanes feed into Hayward from the east and south than leave Hayward to the north, especially at the Route 17/238 interchange — the terminal point of Route 238. Route 17 has no capacity to absorb the traffic from Route 238. The section of Route 238 from I-580 to Route 17 currently is four lanes wide. Widening to 6 or 8 lanes is envisioned, but not within the next 20 years. If this widening occurs, it will do little to relieve congestion unless the capacity of Route 17, north of Route 238, also is nearly doubled. Consequently, peak hour congestion on Route 238 and on I-580 westbound between Redwood Road and Route 238 would delay BART buses traveling on I-580 in mixed flow.

Because congestion occurs today during the morning peak period, and there is no relief in sight, the section of the busway west of the I-580/Route 238 interchange should be constructed in the near future. This decision is independent of a decision on a busway on I-580 through Dublin Canyon. To accommodate both the bus and BART alternatives, the section should be built to BART standards with additional side clearance for buses.

CALTRANS plans to reconstruct the section of Route 238 between Mission Boulevard and I-580 by 1980 as part of the I-580 reconstruction in Dublin Canyon. The busway exit structure should be constructed at the same time as the freeway widening to avoid unnecessary delays, to reduce the total construction costs, to reduce motorist irritation and confusion by tearing up the freeway only once, and to shorten construction impacts on adjacent land uses. To accomplish this, design modifications and processing of the project changes should begin immediately, and CALTRANS and BART should enter into a cooperative agreement for this project. Right of way for the 1,500 foot busway section from Route 238 to Elgin Street also should be acquired soon to ensure timely completion of the entire section of the busway. Federal funds allocated for advance right of way purchase might be used.

I-580 Busway Exit Structure in Dublin — An exclusive busway exit structure will not be necessary in Dublin until the busway in the median of I-580 is constructed. The busway exit structure should have two lanes constructed to BART rail standards. The structure for BART rail and a two-way busway is nearly identical, therefore, no saving would be realized in the long run by going to a one-way, reversible operation.

Las Positas Boulevard Interchange — The proposed West Las Positas Boulevard interchange with I-680 will be a half clover leaf over I-580. It is recommended that BART be placed in a depressed section underneath the freeway ramps in the northeast quadrant. BART would be in an open cut with a tunnel section constructed only where the freeway ramps actually cross the BART alignment. Immediately north and south of the northbound freeway on-ramp, BART would rise to grade. The most economical way to provide for the future construction of BART would be to add a span to the Las Positas Boulevard overpass structure. Accordingly, it is recommended that CALTRANS design plans be revised to allow for this future construction. If these provisions are made now, it would not be necessary to tear up Las Positas Boulevard again to accommodate BART.

Railroad Consolidation and Grade Separations

Pleasanton — Through downtown Pleasanton, the Southern Pacific tracks should be relocated on the right of way of the Western Pacific to permit use of cut and cover subway construction for BART. To complete the railroad consolidation prior to BART construction, work must be initiated no later than one year prior to the scheduled start of the BART subway. New right of way should be reserved and consolidation negotiations initiated immediately.

Funding for this railroad consolidation and grade separation project could come principally from two sources: the California Grade Crossing Elimination Fund and BART construction funds. The California Grade Crossing Elimination Fund is available to localities on an 80/10/10 matching ratio: 80 percent State funds, 10 percent local matching funds, and 10 percent railroad contributions. This amount could be supplemented by funds from BART because it can be established that the cost saving involved in placing BART in a cut and cover subway through Pleasanton, rather than a bored tunnel subway, would nearly offset the cost of relocating the Southern Pacific railroad. The exact amount of the BART contribution would be subject to negotiation.

Livermore — It is essential that much of the Livermore Main Line Railroad Consolidation Project be completed at or prior to BART construction. The North Livermore Avenue, North "P" Street, and Murrieta Boulevard underpasses and the relocated First Street overpass are planned for the first and second phases of the track consolidation and grade crossing elimination program. Because BART would be at grade through Livermore, all remaining at grade crossings must be eliminated before BART could be completed. To ensure compatibility with the proposed BART extension, it is important that the embankment on the east side of the proposed First Street overpass not interfere with the proposed BART alignment.

Right of Way Protection and Early Acquisition Needs

Early acquisition of rights of way for BART would be necessary in areas where future development might block the alignment or where nearby development that cannot be delayed would cause a large increase in land values. Early acquisition of key parcels could result in a significant overall savings to the taxpayers because the property could be acquired at lower cost and held at less than the expected rate of appreciation. Interim transit-related uses may be found for some parcels.

Bay Fair Station — No advance acquisition is necessary at the Bay Fair Station because parking structures or other facilities that might interfere with a BART rail extension are not proposed.

State Route 238 BART/Busway Exit Structure — Because the exit structure for the BART rail line could be used for interim Valley bus service, the right of way for the busway between the State Route 238 exit and Elgin Street should be protected and acquired at an early date. The right of way adjacent to Elgin Street between Bay Fair Station and Ashland Street that would be needed for the bus alternative as well as BART also should be protected.

I-580 Freeway — When I-580 through Dublin Canyon is reconstructed to a full freeway, a level median will be provided to allow for future construction of a busway and/or BART rail line. Therefore, no right of way has to be acquired in advance for this portion of the BART extension. However, the right of way in Dublin between the I-580 exit structure and the Dublin-Northwest Pleasanton Station site should be protected.

Dublin-Northwest Pleasanton Station Site — This station site is attractive for interim bus service because it permits better bus routing and could provide more parking than the Dublin park/ride station on San Ramon Valley Boulevard once the Stoneridge interchange is open. Furthermore, because the site should be reserved for the proposed station in any event, it would make sense to acquire it for interim bus use rather than pay more later. East of this station, all buildings should be set back from Stoneridge Drive to allow for the BART aerial structure. The easiest way to accomplish this is for the City of Pleasanton to require development to conform to a specific plan for the station area that shows BART right of way requirements.

Pleasanton — No action is necessary to protect the BART right of way along I-680 between Stoneridge Drive and Bernal Avenue in Pleasanton because it now belongs to the Flood Control District and CALTRANS and no urban development is possible. However, the proposed West Las Positas interchange should be designed to accommodate BART. From Bernal Avenue to the Pleasanton Station site, the right of way is owned by the San Francisco Water Department, so early acquisition of right of way would not be necessary unless the Water Department intends to sell or lease the land. The right of way between the Pleasanton Station and the Southern Pacific railroad tracks should be protected.

Through downtown Pleasanton, the BART alignment follows the Southern Pacific right of way, so special protection measures would not be necessary until the tracks are relocated. Between Pleasanton and Livermore, the BART alignment is entirely within the railroads' right of way and no protection measures are anticipated.

Major changes in gravel pit operations, such as installation of another conveyor, should be designed around the proposed BART alignment.

Livermore — Here, the proposed BART alignment is north of the Western Pacific tracks and the right of way encroachment into adjacent properties will be up to 30 or 40 feet in some areas. The existing parcels lying within the BART right of way are mostly in single family residential use and, therefore, present no great acquisition cost when BART is constructed. However, acquisition costs would be higher if the City of Livermore were to allow major redevelopment north of the tracks without ensuring dedication or reservation of the BART right of way.

East of Livermore, most of the BART alignment is within or very near the Western Pacific right of way, so no serious problems are anticipated. The proposed site for the East Livermore Station is zoned for industrial use, and the right of way could be protected by regulation or early acquisition, if necessary. The site for the BART yard is bordered on two sides by the Southern Pacific and Western Pacific tracks and, therefore, has a very low potential for development and probably will not require advance acquisition.

TRANSIT SERVICE COORDINATION WITH BART EXTENSION

Bus Service to Bay Fair

Feeder bus service from the Valley to Bay Fair Station began in late 1974. Peak hour schedules on three routes (Pleasanton, Livermore, and the Alameda County portion of the San Ramon Valley) result in peak direction service at Bay Fair at 10 minute average intervals. Each route will serve a park/ride lot to be opened on San Ramon Valley Boulevard in Dublin. Hourly off-peak service is on a single route starting in Livermore and running along Stanley Boulevard to Santa Rita Road, Valley Avenue, Hopyard Road, Dublin Boulevard (to the Dublin park/ride lot when it opens), and I-580 Freeway. The total fleet of 16 buses is expected to grow as patronage increases.

After extension of BART rail service to the Valley, bus service through Dublin Canyon would be replaced by feeder service to BART stations in Dublin, Pleasanton, and Livermore.

Bay Fair Station Improvements — Presently, no modifications are planned to the Bay Fair BART station to accommodate Livermore/San Ramon Valley feeder bus service. The existing 300 feet of bus loading platform is fully utilized by four existing AC Transit routes. Two of these lines terminate at the Bay Fair Station, so buses stop for longer than average periods. According to AC Transit, no more than three of the four existing bus lines should load at the existing platform. Because the loading platform is located on the east side of the station, indirect travel is required for buses serving Hesperian Boulevard.

The addition of new bus routes to serve the Livermore and San Ramon Valleys, as well as anticipated ridership increases on existing AC Transit routes feeding the Bay Fair Station, make early improvements to the bus loading area necessary. Based on evening peak period conditions, an additional 300 feet of bus loading platform are needed to alleviate the existing deficiency, to accommodate the new feeder routes, and to maintain separate loading points for different bus routes. (Separate loading points promote bus line identification and reduce passenger confusion.)

A recommended plan for providing the needed loading area, partially shown on the Bay Fair Station Bus Modification Plan, (see page 89) adds 200 feet of loading platform on the west side of the station with direct access to Hesperian Boulevard, as favored by AC Transit, and 100 feet of platform on the east side. On the west side, all buses would travel in a counterclockwise loop via a new "bus only" entrance on Colby Street opposite Wagner Street. Buses would approach the west side of the station from Hesperian Boulevard at Colby Street, where there is an existing median break and left turn pocket. Buses would leave the station area at the existing signalized station exit north of Colby Street. The new loading area would reduce the length of each bus trip from the west by about 2,000 feet (a travel time saving of 2.5 minutes per bus trip). However, the improvement would require removal of 55 parking spaces on the west side of the station.

The proposed west side platform would free 100 feet of loading platform on the east side of the station for bus routes traveling east. The additional 100 feet of platform will be needed on the east side of the station, which could be provided by lengthening the existing platform to the south. Eighteen parking spaces would have to be removed between the station concourse and the BART system substation. The entrance to this parking area would have to be eliminated and its exit converted to a combined entrance/exit.

Complementary Transit Service to Walnut Creek and Fremont

BART feeder service to Walnut Creek Station from the San Ramon Valley began in December 1974. A single route provides hourly off-peak service between Dublin and the Walnut Creek BART station. During peak periods, headways average 15 minutes between Danville and Walnut Creek Station. AC Transit operates seven buses on the feeder routes under contract to BART.

Trunk line service between Dublin and Walnut Creek would continue after BART is extended to the Valley in order to provide local transit service in the San Ramon Valley and to connect the Livermore-Amador Valley with central Contra Costa County. The BART trip from Dublin to Walnut Creek via Bay Fair Station would take 15 minutes more than by a direct bus route. Because patronage on the basic Dublin-Walnut Creek trunk line is expected to be relatively low for the foreseeable future, service would remain limited. However, the basic service should be supplemented by peak period BART feeder service from Danville north to the Walnut Creek BART Station and from San Ramon south to the proposed Dublin BART Station.

In the near future, no transit service is planned for Niles Canyon/Mission Pass because of low bus patronage potential. Most potential transit riders in this corridor could be served as effectively by BART or an express bus through Dublin Canyon as by Niles Canyon bus service. However, further study might justify extension of hourly Dublin-Walnut Creek bus service south to Fremont to serve local travel and trips not well served by Dublin Canyon routes, as well as to provide continuity in the regional transit network.

Light Rail in the San Ramon Corridor — A high performance electric light rail car route could be built in the San Ramon Valley at substantially less cost than a BART extension. Light rail transit (LRT) is distinguished from BART by use of at grade street crossings, partial or complete manual train control, and power from overhead lines. LRT cars could operate on the Southern Pacific tracks or on an independent alignment. For common trackage operation, legal and jurisdictional problems would have to be resolved. In Walnut Creek, an LRT system could be routed through the Central Business District, perhaps as part of a pedestrian mall. In Dublin, the LRT system could connect with the Dublin-Northwest Pleasanton BART Station via a route along Foothill Road or one along the Alamo Canal. Within the San Ramon Valley, stations could be located at one mile intervals.

A 19 mile LRT system designed to handle a maximum of 5,000 passengers an hour would cost about $35-40 million: $30 million for line construction and rolling stock and about $5-10 million for right of way acquisition and construction of support facilities and car stops. Present demand for transit service in the San Ramon Valley does not appear to warrant capital investments of this magnitude. When peak period patronage on the San Ramon bus reaches a level of 2,000 passengers an hour, the cost effectiveness of an LRT system should be re-evaluated.

Local Feeder Bus Service

Upon extension of BART to the Valley, local feeder bus systems should be developed to serve the new BART stations, thereby reducing parking needs and increasing BART ridership potential. It would be desirable to design these systems to facilitate non-BART local travel within adjacent communities. While general guidelines for service can be established at this time, detailed route design of the bus feeder systems should not be attempted until after a decision is made to proceed with the BART extension.

Castro Valley — Transit service in Castro Valley presently consists of feeder service to the Bay Fair and Hayward BART stations on the Fremont line. Under the Bus Alternative, no stop would be provided in Castro Valley, so there would be no major changes in local feeder service. However, with a BART extension to Livermore the existing bus feeder service should be replaced by feeder service to the proposed Castro Valley BART Station.

Pleasanton, Dublin, and Livermore — Feeder service must be provided to all four Valley BART stations. These stations have been designed to accommodate up to 50 percent of anticipated patrons in park/ride lots and 25 percent being dropped off and walking or using taxis and bicycles. The remaining 25 percent would use local feeder transit, resulting in approximately 9,400 daily trips on feeder buses to and from BART stations in 1990. The Dublin-Northwest Pleasanton, Pleasanton, and West Livermore BART Stations would attract approximately 2,500 daily transit trips each (1,250 each way), and the East Livermore Station would attract the remaining 1,900 transit trips. Without feeder service, 4,300 additional parking spaces, requiring 40 acres of land, would have to be distributed among the four Valley BART stations.

For the Dublin and Pleasanton stations, feeder bus service would not be substantially different than local routing for the Bus Alternative because BART stations would be located at or near proposed park/ride sites. However, in Livermore new feeder bus systems would have to be developed. Local service under the Bus Alternative would be oriented toward two park/ride lots. The proposed site of Lot One is in north Livermore, immediately east of Portola Avenue and Murrieta Boulevard, while Lot Two could be on the proposed site for the West Livermore BART Station. The new feeder bus system would split into two parts. North, south, and southwest Livermore would be served by a new feeder system oriented toward the West Livermore BART Station. East Livermore and areas north of I-580 such as Springtown would be served best by a bus system feeding the East Livermore BART Station.

SELECTED BIBLIOGRAPHY

GENERAL PLANS

Alameda County Planning Department, 1966. General Plan, and 1970. Proposed Open Space Plan.

Alameda County Planning Department, 1972. Castro Valley General Plan.

Contra Costa County Planning Department, 1967. Alamo-Danville General Plan.

Contra Costa County Planning Department, 1971. San Ramon General Plan.

Livermore City Planning Department, 1971. Livermore General Plan Open Space Element; Livermore Trailway System.

Livermore City Planning Department, 1972. General Plan.

Pleasanton City Planning Department, 1968, with proposed revisions 1973-75. General Plan.

Walnut Creek City Planning Department, 1972. General Plan.

REGIONAL LAND USE AND TRANSPORTATION PLANS

Association of Bay Area Governments, 1970. ABAG Regional Plan 1970-1990.

Association of Bay Area Governments, 1971. ABAG Summary Report.

Metropolitan Transportation Commission, 1973 with 1974 Revisions. Regional Transportation Plan.

Metropolitan Transportation Commission, 1974. Transit Development Program for the San Francisco Bay Area 1975-1984.

OTHER REFERENCES

Alameda County Flood Control and Water Conservation District, 1966. Flood Control Plan, Zone No. 7, Special Drainage Area 7-1.

Alameda County Planning Department, 1973. Environmental Impact Report General Plan Amendment Consideration, Pleasanton-Dublin Hill Area.

Alameda County Planning Department, 1974. Environmental Impact Report, North Livermore Area, Plan Amendment Consideration Volume I and II.

Arthur D. Little, Inc., 1971. Transportation and Environment: Synthesis for Action. Prepared for U.S. Department of Transportation, Office of the Secretary, Assistant Secretary for Environment and Urban Systems.

BART, 1971. Preliminary Route Study Dublin Canyon Corridor Along I-580.

BART Office of Research, 1972. The BART Interstation Fare Schedule.

BART Office of Planning, 1973. Development Around BART Stations.

Boyce, D.E., B. Allen, R.R. Mudge, P.B. Slater and A.M. Isserman, 1972. Impact of Rapid Transit on Suburban Residential Property Values and Land Development, Analysis of the Philadelphia-Lindenwold High Speed Line. Prepared for U.S. Department of Transportation.

Boyce, D.E., B. Allen, G. Desfor and R. Zuker, 1972. Impact of Access Distance and Parking Availability on Suburban Rapid Transit Station Choice, (Analysis of the Philadelphia-Lindenwold High Speed Line.

Bragden, Clifford R., 1973. Noise Pollution.

Brown, R.D., Jr., 1970. Faults that are Historically Active or That Show Evidence of Geologically Young Surface Displacements, San Francisco Bay Region, a progress report, October 1970. San Francisco Bay Region Environment and Resources Planning Study, Basic Data Contribution 7; or U.S. Geological Survey Miscellaneous Field Studies Map MF-311, scale 1:250,000.

Brown, R.D., Jr., and Lee, W.H.K., 1971. Active Faults and Preliminary Earthquake Epicenters (1969-70) in the Southern Part of the San Francisco Bay region, San Francisco Bay Region Environment and Resources Planning Study, Basic Data Contribution 30; or U.S. Geological Survey Miscellaneous Field Studies Map MF-307, scale 1:250,000.

Brown and Caldwell, 1972. Water Quality Management Plan for the Alameda Creek Watershed above Niles. Prepared for Alameda County County Flood Control and Water Conservation District.

California Department of Transportation. 1972. Final Environmental Impact Statement, Joint Freeway - Mass Transit Corridor Project on Routes 580 and 238 in Alameda County. District 4, Environmental Planning Branch.

California Department of Transportation, 1974. Air Quality Impact Report, Second Supplement. Joint Freeway - Mass Transit Corridor Project on Interstate Route 580 and State Route 238 in Alameda County. District 4, Environmental Planning Branch.

De Leuw, Cather & Company, 1971. Livermore-Amador Valley Transportation Needs Study. Prepared for Livermore-Amador Valley Transportation Board.

De Leuw, Cather & Company, 1974. Characteristics of Urban Transportation Systems, A Handbook for Transportation Planners. Prepared for U.S. Department of Transportation, Urban Mass Transportation Administration.

Development Research Associates, n.d. An Evaluation of the Economic Impact of the Existing Lindenwold Line. Prepared for Delaware River Port Authority, Mass Transportation Development Program.

Development Research Associates, 1967, Economic Analysis of Downtown Livermore. Prepared for City of Livermore.

Duncan and Jones, 1973. BART Station Area Plan. Prepared for City of Walnut Creek.

Gannon, C.A. et al, 1972. The Impact of Rail Transit Systems on Commercial Office Development. The Case of the Philadelphia - Lindenwold Speed Line. Prepared for U.S. Department of Transportation, Urban Mass Transportation Administration.

Gebman, J.R., 1971. The Mechanics of Forecasting the Community Noise Impact of a Transportation System. The Rand Corporation, Santa Monica.

Gruen Gruen + Associates, 1973. Economic and Social Analysis of Three Oakland BART Station Areas: MacArthur, Rockridge, Fruitvale. Prepared for City of Oakland.

Hall, C.A., Jr., 1958. Geology and Paleontology of the Pleasanton Area, Alameda and Contra Costa Counties, California. University of California Publications, Geol. Sci. Bull., Vol. 34, No. 1, Map 1, scale 1:34,000.

City of Hayward, Okamoto/Liskamm, Development Research Associates, 1968. Hayward Rapid Transit Area Impact Studies.

Healy, T.J., 1973. Energy Requirements of the Bay Area Rapid Transit System. Prepared for California Department of Transportation, Division of Transportation Planning.

Highway Research Board, 1973. Procedures for Estimating Highway User Cost, Air Pollution and Noise Effects. National Cooperative Highway Research Program Report 133.

Larsen, R.I., 1971. A Mathematical Model for Relating Air Quality Measurements to Air Quality Standards. Prepared for U.S. Environmental Protection Agency, Office of Air Programs.

Lee, D.B., Jr., 1973. The Effects of Investment in Rapid Transit on the Prices of Single Famile Residential Properties. Department of City and Regional Planning, University of California, Berkeley.

Livingston and Blayney, 1972. Pleasanton General Plan Review, Alternate Growth Policies. Prepared for City of Pleasanton.

Metropolitan Transportation Commission, 1974. Special Report on Transit Finance.

Metropolitan Transportation Commission, 1974. An Evaluation of Impact Accessibility to the Livermore Valley and its Effects on Population Growth and Air Quality. (Preliminary Staff Report).

Murphy Levy Wurman, 1972. Station Design Criteria. Prepared for Delaware River Port Authority, Mass Transportation Development Program.

Murphy Levy Wurman, 1972. Environmental Design Criteria. Prepared for Delaware River Port Authority, Mass Transportation Development Program.

Pleasanton Planning Department, C.B.D. Committee, 1974. A Development Plan and Revitalization Program for the Central Business District of Pleasanton.

Robinson, G.D., 1956. Geology of the Hayward Quadrangle, California. U.S. Geological Survey Geologic Quadrangle Map CQ 88, scale 1:24,000 (geology of Castro Valley and highway 50 eastward about 4 miles).

Wagner, Holly C. and Kelley, Frederick, 1962. Road Log 1, U.S. Highway 50 from Hayward to Tracy, California. California Division of Mines and Geology Bull. 182, pp. 51-54, Pl. 2, scale 1:62,500 (after Hall, 1968; Robinson, 1956, 1953; Huey, 1948).

Wilbur Smith and Associates, 1973. Regional Transit/Travel Projections Project, Task 1 Summary Report. Prepared for BART and the Metropolitan Transportation Commission.

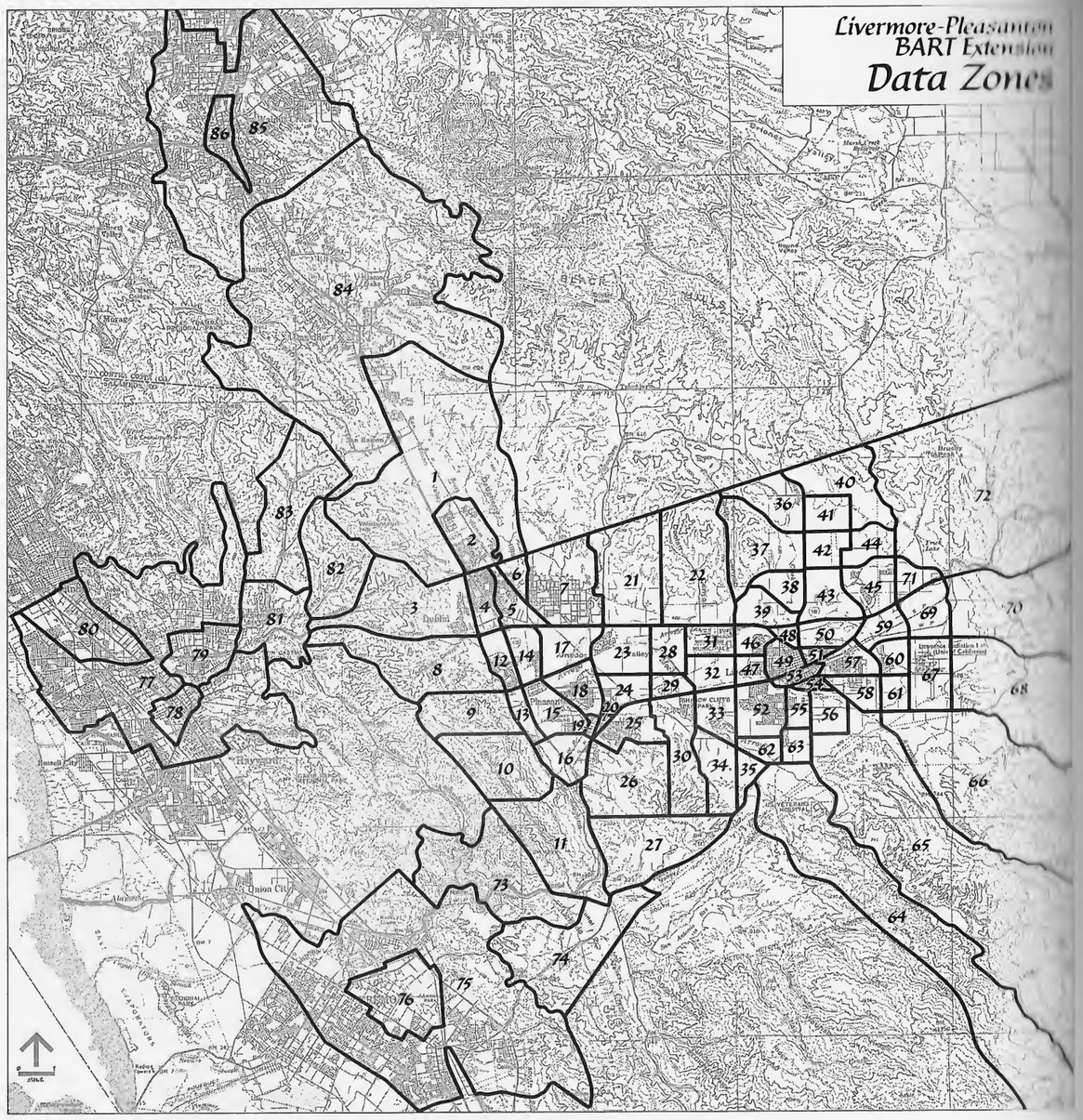
Wilsey & Ham, 1972. Las Positas New Town: Proposed Amendment to the Alameda County General Plan.

APPENDIX

APPENDIX A

DATA ZONES

During the course of the study 86 data zones were utilized for analysis, 72 of which are in the Valley. MTC map zones and census tract boundaries are used in the corridors, while Valley zones are the planning sectors designated by the Livermore and Pleasanton planning departments and census tracts in Dublin and San Ramon. Slight changes were made in the cities' planning sectors to conform with census tract boundaries and RTTPP zones used for patronage forecasting. A correspondence table linking the 86 data zones with the MTC/ABAG zone system and census tracts is included in the Data report.



APPENDIX B

DETAILED EVALUATION OF FINAL ALTERNATIVES

Six routes were selected by the Board for evaluation during the final alternatives phase of the study traversing two corridors and three Valley routes. To facilitate corridor comparisons, the San Ramon Valley and Dublin Canyon lines were paired in the Valley. In this way, the differences expressed by various evaluation criteria would represent the differences between the two corridors. All lines have four Valley stations. Dublin Canyon lines have one corridor station, and San Ramon lines have five or six corridor stations. The summary line descriptions below correspond to the routes and station locations shown on the Final Alternatives map.

Line Descriptions

The selected route described as the Blue Line (Dublin Canyon-South Valley) provides maximum service to existing and proposed commercial centers, serving downtown Livermore and Pleasanton and the proposed Stoneridge regional shopping center. Stations are Castro Valley, Northwest Pleasanton (D), Pleasanton (J), and Livermore (L and O).

The Red Line (Dublin Canyon-North Valley) avoids intensively developed areas, crossing the Valley between the gravel pits and I-580 and skirting the north side of Livermore. Stations are Castro Valley, Northwest Pleasanton (D), Pleasanton (F), and Livermore (K and O).

The Green Line (Dublin Canyon-North Valley-Downtown Livermore) parallels I-580 about 0.6 miles to the south and then curves further south to enter downtown Livermore. Stations are Castro Valley, Northwest Pleasanton (D), Pleasanton (F), and Livermore (L and O).

The Orange Line (San Ramon-South Valley) runs alongside I-680 to Danville and then borders the Southern Pacific tracks south to Dublin, where it turns southwest and follows the Blue Line to Livermore. Stations are West Walnut Creek (W), Livorna Road, Danville, San Ramon, Dublin (A), Northwest Pleasanton (Q), Pleasanton (J), and Livermore (L and O).

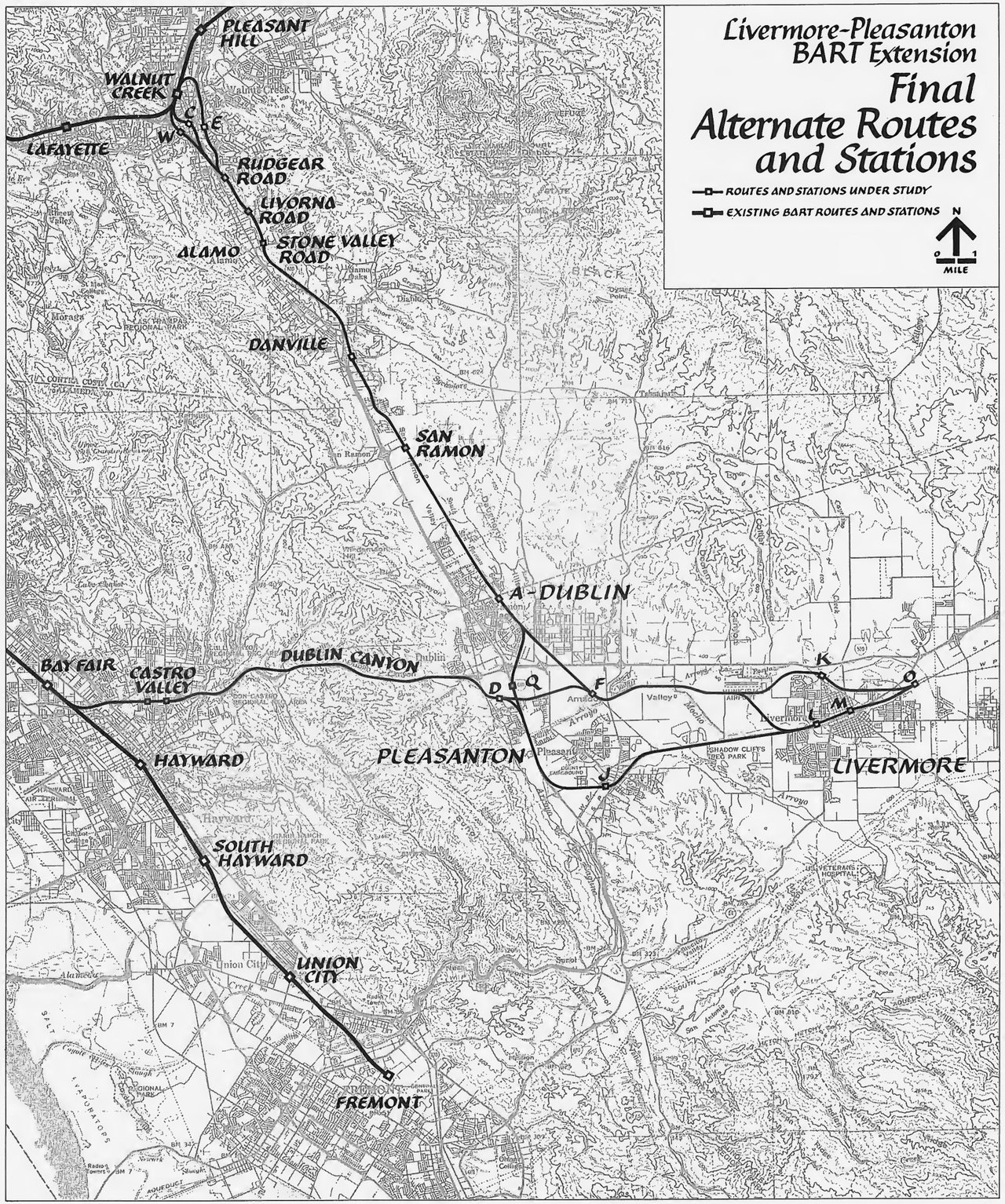
The Yellow Line (San Ramon-North Valley) follows the Orange Line south to Dublin and continues alongside the Southern Pacific tracks until it joins the Red Line. Stations are East Walnut Creek (E), Livorna Road, Danville, San Ramon, Dublin (A), Pleasanton (F), and Livermore (K and O).

The Brown Line (San Ramon-North Valley-Downtown Livermore) extends from the Concord line along I-680 to Danville and then parallels the Southern Pacific tracks to northeast Pleasanton where it joins the Green Line. Stations are Central Walnut Creek (C), Rudgear Road, Stone Valley Road, Danville, San Ramon, Dublin (A), Pleasanton (F), and Livermore (L and O).

Evaluation Tables

Each of the final alternatives was evaluated in relation to nine planning objectives. The first six tables that follow show the impacts and measures of compliance with the prescribed evaluation criteria for individual stations, links in the Valley, and corridors. On the final summary table, the lines have been ranked for their compliance with each objective. By presenting the individual measures along with the totals for each line and the summary rankings, important differences are not masked. Any reader who does not agree with the ranking assigned and the relative weight accorded criteria and objectives, can assign new rankings based on different weighting and evaluate the outcome. For details on how these measures were computed and information on other evaluation criteria such as travel costs and community impacts, the reader should consult the Final Alternatives report.

Three value scales are used in the tables. An ordinal scale, A to G, is used to rank stations or links according to judgments about urban design potential, compatibility with existing general plans, or other factors that are hard to quantify. An interval scale is used to define the order and relative magnitude of difference between data items with an arbitrary origin. Examples are distance from a BART line to existing development or the acreage subject to land use change if a particular link or station were built. Use of a non-arbitrary origin transforms this scale into a ratio scale measuring units such as time, money, and people served.


Livermore-Pleasanton
BART Extension
Final
Alternate Routes
and Stations
ROUTES AND STATIONS UNDER STUDY
EXISTING BART ROUTES AND STATIONS
N
0
1
MILE
PLEASANT HILL
WALNUT CREEK
C
E
W
LAFAYETTE
RUDGEAR ROAD
LIVORNA ROAD
STONE VALLEY ROAD
ALAMO
DANVILLE
SAN RAMON
A-DUBLIN
BAY FAIR
CASTRO VALLEY
DUBLIN CANYON
D
Q
F
K
M
L
O
J
HAYWARD
PLEASANTON
LIVERMORE
SOUTH HAYWARD
UNION CITY
FREMONT

BLUE LINE EVALUATION (Dublin Canyon Corridor 24.1 Miles)

Judgment Measures On An Ordinal Scale:

A--100% or exceptional; B--excellent; C--good, better than; D--average, workable, acceptable; E--fair, less than; F--poor; G--none.

	Scale; Unit of Measurement	Total Summary	Link	Castro Valley Station CV	Link	Pleasanton Station D	Link	Pleasanton Station J	Link	Livermore Station L	Link	Livermore Station O
1. Objective: Minimize BART Construction and Operating Costs												
b. Total capital cost	Ratio; million $ 1972	250										
2. Objective: Maximize BART Usage												
a. Population potential within 1,500 ft. of stations	Ratio; persons	22,560		4,200		2,660		4,100		4,100		7,500
b. Population 1980 within 1 mile service area from stations	Ratio; persons	97,900		46,300[a]		7,300		9,400		23,700		11,200
c. Population potential within 1 mile service area from stations in addition to Criterion b	Ratio; persons	16,800		6,100[b]		4,500		2,300		700		3,200
d. Accessibility of stations to 1980 population within 8 minutes driving time	Ratio; index = population ÷ driving time to station	54		n.a.		39		63		93		20
e. Existing and potential employment 1972	Ratio; persons	1,140		300		0		20		800		20
within 1,500 feet of stations (1990)	Ratio; persons	(9,100)		(500)		(4,000)		(1,000)		(1,600)		(2,000)
f. BART patronage projections, 1980	Ratio; total trips	27,582										
g. Average travel time for Valley BART patrons	Ratio; minutes	37.45										
h. Suitability to serve young, old, poor, and disabled	Ordinal			E		G		D		D		F
4. Objective: Avoid Change in Developed Residential Neighborhoods												
a. Proximity of stations to existing development	Interval; index increases with distance	10		0		10		0		0		38
b. Propensity for change in neighborhoods near BART stations	Interval; index decreases with acreage subject to change	63		0		63		97		56		98
c. Line displacement	Ratio; residences	70	53		0		0		0		17	
	Ratio; businesses	11	1		0		0		0		10	
d. Access to station site	Ordinal			D		D		A		B		B
e. Station displacement	Ratio; residences	54		54		0		0		0		0
	Ratio; businesses	7		7		0		0		0		0
5. Objective: Maximize Environmental Compatibility												
a. Noise levels	Ordinal; rank based on linear feet		B		B		B		D		B	
b. Visual and physical fit	Ordinal		D	C	D	C	C	D	E	D	E	E
c. Urban design potential	Ordinal			B		C		D		D		F
6. Objective: Minimize Inequities Created by a BART Extension												
a. Displacement by stations and routes	Ratio; residences	124	53	54	0	0	0	0	0	0	17	0
	Ratio; businesses	18	1	7	0	0	0	0	0	0	10	0
7. Objective: Preserve Maximum Open Space												
a. Population potential within 1,500 ft. of stations	Ratio; persons	22,560		4,200		2,660		4,100		4,100		7,500
b. Population potential within 1 mile service area from stations	Ratio; persons	114,700		52,400[b]		11,800		11,700		24,400		14,400
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line												
a. Net change in jobs projected in 1990 within 1 mile of extension terminal	Ordinal	E										
b. Net change in RTTPP I projected attractions with an extension	Ratio; trips	+313										
c. Development potential near extension terminal	Ordinal	E										
13. Objective: Maximize Compatibility with Existing General Plans												
a. Degree of conflict with existing general plans	Ordinal			E		D		D		E		D
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions												
a. Available capacity on existing line	Ordinal	C										
b. Compatibility with transfers to a bus system	Ordinal	D										
c. Compatibility with transfers to a rail system	Ordinal	D										

[a] 1980 tributary population (approximately 2-1/2 miles).

[b] 1990 tributary population (approximately 2-1/2 miles).

RED LINE EVALUATION (Dublin Canyon Corridor 22.5 Miles)

Judgment Measures On An Ordinal Scale:

A--100% or exceptional; B--excellent; C--good, better than;
D--average, workable, acceptable; E--fair, less than; F--poor;
G--none.

	Scale; Unit of Measurement	Total Summary	Link	Castro Valley Station CV	Link	Pleasanton Station D	Link	Pleasanton Station F	Link	Livermore Station K	Link	Livermore Station O
1. Objective: Minimize BART Construction and Operating Costs												
b. Total capital cost	Ratio; million $ 1972	239										
2. Objective: Maximize BART Usage												
a. Population potential within 1,500 ft. of stations	Ratio; persons	24,390		4,200		2,660		4,680		5,350		7,500
b. Population 1980 within 1 mile service area from stations	Ratio; persons	87,600		46,300[a]		7,300		8,400		14,400		11,200
c. Population potential within 1 mile service area from stations in addition to Criterion b	Ratio; persons	27,400		6,100[b]		4,500		2,800		10,800		3,200
d. Accessibility of stations to 1980 population within 8 minutes driving time	Ratio; index = population ÷ driving time to station	42		n.a.		39		24		85		20
e. Existing and potential employment 1972	Ratio; persons	350		300		0		0		30		20
within 1,500 feet of stations (1990)	Ratio; persons	(8,400)		(500)		(4,000)		(1,800)		(100)		(2,000)
f. BART patronage projections, 1980	Ratio; total trips	27,582										
g. Average travel time for Valley BART patrons	Ratio; minutes	36.92										
h. Suitability to serve young, old, poor, and disabled	Ordinal			E		G		G		E		F
4. Objective: Avoid Change in Developed Residential Neighborhoods												
a. Proximity of stations to existing development	Interval; index increases with distance	14		0		10		14		6		38
b. Propensity for change in neighborhoods near BART stations	Interval; index decreases with acreage subject to change	56		0		63		95		22		98
c. Line displacement	Ratio; residences	147	53		0		0		70		24	
	Ratio; businesses	7	1		0		0		2		4	
d. Access to station site	Ordinal			D		D		B		A		B
e. Station displacement	Ratio; residences	54		54		0		0		0		0
	Ratio; businesses	7		7		0		0		0		0
5. Objective: Maximize Environmental Compatibility												
a. Noise levels	Ordinal; rank based on linear feet		B		B		A		D		C	
b. Visual and physical fit	Ordinal		D	C	D	C	E	E	C	C	D	E
c. Urban design potential	Ordinal			B		C		C		E		F
6. Objective: Minimize Inequities Created by a BART Extension												
a. Displacement by stations and routes	Ratio; residences	201	53	54	0	0	0	0	70	0	24	0
	Ratio; businesses	14	1	7	0	0	0	0	2	0	4	0
7. Objective: Preserve Maximum Open Space												
a. Population potential within 1,500 ft. of stations	Ratio; persons	24,390		4,200		2,660		4,680		5,350		7,500
b. Population potential within 1 mile service area from stations	Ratio; persons	115,000		52,400[b]		11,800		11,200		25,200		14,400
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line												
a. Net change in jobs projected in 1990 within 1 mile of extension terminal	Ordinal	E										
b. Net change in RTTPP I projected attractions with an extension	Ratio; trips	+313										
c. Development potential near extension terminal	Ordinal	E										
13. Objective: Maximize Compatibility with Existing General Plans												
a. Degree of conflict with existing general plans	Ordinal			E		D		D		D		D
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions												
a. Available capacity on existing line	Ordinal	C										
b. Compatibility with transfers to a bus system	Ordinal	A										
c. Compatibility with transfers to a rail system	Ordinal	D										

[a] 1980 tributary population (approximately 2-1/2 miles).

[b] 1990 tributary population (approximately 2-1/2 miles).

GREEN LINE EVALUATION (Dublin Canyon Corridor 22.8 Miles)

Judgment Measures On An Ordinal Scale:

A--100% or exceptional; B--excellent; C--good, better than;
D--average, workable, acceptable; E--fair, less than; F--poor;
G--none.

	Scale; Unit of Measurement	Total Summary	Link	Castro Valley Station CV	Link	Pleasanton Station D	Link	Pleasanton Station F	Link	Livermore Station L	Link	Livermore Station O
1. Objective: Minimize BART Construction and Operating Costs												
b. Total capital cost	Ratio; million $ 1972	235										
2. Objective: Maximize BART Usage												
a. Population potential within 1,500 ft. of stations	Ratio; persons	23,140		4,200		2,660		4,680		4,100		7,500
b. Population 1980 within 1 mile service area from stations	Ratio; persons	96,900		46,300[a]		7,300		8,400		23,700		11,200
c. Population potential within 1 mile service area from stations in addition to Criterion b	Ratio; persons	17,300		6,100[b]		4,500		2,800		700		3,200
d. Accessibility of stations to 1980 population within 8 minutes driving time	Ratio; index = population ÷ driving time to station	44		n.a.		39		24		93		20
e. Existing and potential employment 1972	Ratio; persons	1,120		300		0		0		800		20
within 1,500 feet of stations (1990)	Ratio; persons	(9,900)		(500)		(4,000)		(1,800)		(1,600)		(2,000)
f. BART patronage projections, 1980	Ratio; total trips	27,582										
g. Average travel time for Valley BART patrons	Ratio; minutes	37.00										
h. Suitability to serve young, old, poor, and disabled	Ordinal			E		G		G		D		F
4. Objective: Avoid Change in Developed Residential Neighborhoods												
a. Proximity of stations to existing development	Interval; index increases with distance	12		0		10		14		0		38
b. Propensity for change in neighborhoods near BART stations	Interval; index decreases with acreage subject to change	62		0		63		95		56		98
c. Line displacement	Ratio; residences	70	53		0		0		0		17	
	Ratio; businesses	11	1		0		0		0		10	
d. Access to station site	Ordinal			D		D		B		B		B
e. Station displacement	Ratio; residences	54		54		0		0		0		0
	Ratio; businesses	7		7		0		0		0		0
5. Objective: Maximize Environmental Compatibility												
a. Noise levels	Ordinal; rank based on linear feet		B		B		B		B		B	
b. Visual and physical fit	Ordinal		D	C	D	C	C	E	D	D	E	E
c. Urban design potential	Ordinal			B		C		C		D		F
6. Objective: Minimize Inequities Created by a BART Extension												
a. Displacement by stations and routes	Ratio; residences	124	53	54	0	0	0	0	0	0	17	0
	Ratio; businesses	18	1	7	0	0	0	0	0	0	10	0
7. Objective: Preserve Maximum Open Space												
a. Population potential within 1,500 ft. of stations	Ratio; persons	23,140		4,200		2,660		4,680		4,100		7,500
b. Population potential within 1 mile service area from stations	Ratio; persons	114,200		52,400[b]		11,800		11,200		24,400		14,400
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line												
a. Net change in jobs projected in 1990 within 1 mile of extension terminal	Ordinal	E										
b. Net change in RTTPP I projected attractions with an extension	Ratio; trips	+313										
c. Development potential near extension terminal	Ordinal	E										
13. Objective: Maximize Compatibility with Existing General Plans												
a. Degree of conflict with existing general plans	Ordinal			E		D		D		E		D
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions												
a. Available capacity on existing line	Ordinal	C										
b. Compatibility with transfers to a bus system	Ordinal	C										
c. Compatibility with transfers to a rail system	Ordinal	B										

[a] 1980 tributary population (approximately 2-1/2 miles).

[b] 1990 tributary population (approximately 2-1/2 miles).

ORANGE LINE EVALUATION (San Ramon Corridor 30.0 Miles)

Judgment Measures On An Ordinal Scale:

A--100% or exceptional; B--excellent; C--good, better than;
D--average, workable, acceptable; E--fair, less than; F--poor;
G--none.

	Scale; Unit of Measurement	Total Summary	Link	Walnut Creek Station W	Link	Livorna Road Station	Link	Danville Station	Link	San Ramon Station	Link	Dublin Station A	Link	Pleasanton Station Q	Link	Pleasanton Station J	Link	Livermore Station L	Link
1. Objective: Minimize BART Construction and Operating Costs																			
b. Total capital cost	Ratio; million $ 1972	331																	
2. Objective: Maximize BART Usage																			
a. Population potential within 1,500 ft. of stations	Ratio; persons	22,200		1,200		200		2,100		500		1,300		1,200		4,100		4,100	
b. Population 1980 within 1 mile service area from stations	Ratio; persons	155,400		24,000[a]		31,000[a]		16,000[a]		11,500[a]		20,000		8,600		9,400		23,700	
c. Population potential within 1 mile service area from stations in addition to Criterion b	Ratio; persons	62,000		8,700[b]		16,400[b]		20,100[b]		3,400[b]		3,500		3,700		2,300		700	
d. Accessibility of stations to 1980 population within 8 minutes driving time	Ratio; index = population ÷ driving time to station	61		n.a.		n.a.		n.a.		n.a.		n.a.		69		63		93	
e. Existing and potential employment within 1,500 feet of stations 1972	Ratio; persons	4,260		2,750		0		20		200		100		50		20		800	
(1990)	Ratio; persons	(22,620)		(15,150)		(0)		(20)		(2,000)		(150)		(300)		(1,000)		(1,600)	
f. BART patronage projections, 1980	Ratio; total trips	22,660																	
g. Average travel time for Valley BART patrons	Ratio; minutes	41.18																	
h. Suitability to serve young, old, poor, and disabled	Ordinal			E		G		G		F		E		E		D		D	
4. Objective: Avoid Change in Developed Residential Neighborhoods																			
a. Proximity of stations to existing development	Interval; index increases with distance	17		0		0		0		100		0		12		0		0	
b. Propensity for change in neighborhoods near BART stations	Interval; index decreases with acreage subject to change	64		69		39		3		66		53		98		97		56	
c. Line displacement	Ratio; residences	101	58	26		0		0		0		0		0		0		0	17
	Ratio; businesses	16	4	2		0		0		0		0		0		0		0	10
d. Access to station site	Ordinal			B		D		C		B		B		C		A		B	
e. Station displacement	Ratio; residences	55		32		0		23		0		0		0		0		0	
	Ratio; businesses	0		0		0		0		0		0		0		0		0	
5. Objective: Maximize Environmental Compatibility																			
a. Noise levels	Ordinal; rank based on linear feet			E		D		A		D		F		F		F		D	B
b. Visual and physical fit	Ordinal			E	D	E	E	E	D	D	D	C	D	D	D	C	D	E	D	E
c. Urban design potential	Ordinal			D		E		E		E		E		E		D		D	
6. Objective: Minimize Inequities Created by a BART Extension																			
a. Displacement by stations and routes	Ratio; residences	156	58	32	26	0	0	23	0	0	0	0	0	0	0	0	0	0	17
	Ratio; businesses	16	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	10
7. Objective: Preserve Maximum Open Space																			
a. Population potential within 1,500 ft. of stations	Ratio; persons	22,200		1,200		200		2,100		500		1,300		1,200		4,100		4,100	
b. Population potential within 1 mile service area from stations	Ratio; persons	217,400		32,700[b]		47,400[b]		36,100[b]		14,900[b]		23,500		12,300		11,700		24,400	
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line																			
a. Net change in jobs projected in 1990 within 1 mile of extension terminal	Ordinal	C																	
b. Net change in RTTPP I projected attractions with an extension	Ratio; trips	+74																	
c. Development potential near extension terminal	Ordinal	C																	
13. Objective: Maximize Compatibility with Existing General Plans																			
a. Degree of conflict with existing general plans	Ordinal			E		E		E		D		D		D		D		E	
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions																			
a. Available capacity on existing line	Ordinal	E																	
b. Compatibility with transfers to a bus system	Ordinal	B																	
c. Compatibility with transfers to a rail system	Ordinal	D																	

[a] 1980 tributary population (approximately 2-1/2 miles).

[b] 1990 tributary population (approximately 2-1/2 miles).

YELLOW LINE EVALUATION (San Ramon Corridor

Judgment Measures On An Ordinal Scale

A--100% or exceptional; B--excellent; C--good
D--average, workable, acceptable; E--fair, less
G--none.

1. Objective: Minimize BART Construction and Operating Costs
   b. Total capital cost
2. Objective: Maximize BART Usage
   a. Population potential within 1,500 ft. of stations
   b. Population 1980 within 1 mile service area from stations
   c. Population potential within 1 mile service area from stations in addition to Criterion b
   d. Accessibility of stations to 1980 population within 8 minutes driving time
   e. Existing and potential employment within 1,500 feet of stations
   f. BART patronage projections, 1980
   g. Average travel time for Valley BART patrons
   h. Suitability to serve young, old, poor, and disabled
4. Objective: Avoid Change in Developed Residential Neighborhoods
   a. Proximity of stations to existing development
   b. Propensity for change in neighborhoods near BART stations
   c. Line displacement
   d. Access to station site
   e. Station displacement
5. Objective: Maximize Environmental Compatibility
   a. Noise levels
   b. Visual and physical fit
   c. Urban design potential
6. Objective: Minimize Inequities Created by a BART Extension
   a. Displacement by stations and routes
7. Objective: Preserve Maximum Open Space
   a. Population potential within 1,500 ft. of stations
   b. Population potential within 1 mile service area from stations
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line
   a. Net change in jobs projected in 1990 within 1 mile of extension terminal
   b. Net change in RTTPP I projected attractions with an extension
   c. Development potential near extension terminal
13. Objective: Maximize Compatibility with Existing General Plans
   a. Degree of conflict with existing general plans
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions
   a. Available capacity on existing line
   b. Compatibility with transfers to a bus system
   c. Compatibility with transfers to a rail system

[a] 1980 tributary population (approximately

[b] 1990 tributary population (approximately

YELLOW LINE EVALUATION (San Ramon Corridor 27.5 Miles)

Judgment Measures On An Ordinal Scale:

A--100% or exceptional; B--excellent; C--good, better than;
D--average, workable, acceptable; E--fair, less than; F--poor;
G--none.

	Scale; Unit of Measurement	Total Summary	Link	Walnut Creek Station E	Link	Livorna Road Station	Link	Danville Station	Link	San Ramon Station	Link	Dublin Station A	Link	Pleasanton Station F	Link	Livermore Station K	Link	Livermore Station O
1. Objective: Minimize BART Construction and Operating Costs																		
b. Total capital cost	Ratio; million $ 1972	305																
2. Objective: Maximize BART Usage																		
a. Population potential within 1,500 ft. of stations	Ratio; persons	23,630		2,000		200		2,100		500		1,300		4,680		5,350		7,500
b. Population 1980 within 1 mile service area from stations	Ratio; persons	136,500		24,000[a]		31,000[a]		16,000[a]		11,500[a]		20,000		8,400		14,400		11,200
c. Population potential within 1 mile service area from stations in addition to Criterion b	Ratio; persons	68,900		8,700[b]		16,400[b]		20,100[b]		3,400[b]		3,500		2,800		10,800		3,200
d. Accessibility of stations to 1980 population within 8 minutes driving time	Ratio; index = population ÷ driving time to station	43		n.a.		n.a.		n.a.		n.a.		n.a.		24		85		20
e. Existing and potential employment 1972	Ratio; persons	4,370		4,000		0		20		200		100		0		30		20
within 1,500 feet of stations (1990)	Ratio; persons	(13,920)		(9,650)		(0)		(20)		(2,000)		(150)		(1,800)		(100)		(200)
f. BART patronage projections, 1980	Ratio; total trips	22,660																
g. Average travel time for Valley BART patrons	Ratio; minutes	40.14																
h. Suitability to serve young, old, poor, and disabled	Ordinal			D		G		G		F		E		G		E		F
4. Objective: Avoid Change in Developed Residential Neighborhoods																		
a. Proximity of stations to existing development	Interval; index increases with distance	20		0		0		0		100		0		14		6		38
b. Propensity for change in neighborhoods near BART stations	Interval; index decreases with acreage subject to change	59		98		39		3		66		53		95		22		98
c. Line displacement	Ratio; residences	105	0		11		0		0		0		0		70		24	
	Ratio; businesses	6	0		0		0		0		0		0		2		4	
d. Access to station site	Ordinal			C		D		C		B		B		B		A		B
e. Station displacement	Ratio; residences	23		0		0		23		0		0		0		0		0
	Ratio; businesses	1		1		0		0		0		0		0		0		0
5. Objective: Maximize Environmental Compatibility																		
a. Noise levels	Ordinal; rank based on linear feet			F		E		A		D		F		F		D		C
b. Visual and physical fit	Ordinal			D	D	E	E	E	D	D	D	C	D	C	E	C	C	D	E
c. Urban design potential	Ordinal				D		E		E		E		E		C		B		F
6. Objective: Minimize Inequities Created by a BART Extension																		
a. Displacement by stations and routes	Ratio; residences	128	0	0	11	0	0	23	0	0	0	0	0	0	70	0	24	0
	Ratio; businesses	7	0	1	0	0	0	0	0	0	0	0	0	0	2	0	4	0
7. Objective: Preserve Maximum Open Space																		
a. Population potential within 1,500 ft. of stations	Ratio; persons	23,630		2,000		200		2,100		500		1,300		4,680		5,350		7,500
b. Population potential within 1 mile service area from stations	Ratio; persons	205,400		32,700[b]		47,700[b]		36,100[b]		14,900[b]		23,500		11,200		25,200		14,400
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line																		
a. Net change in jobs projected in 1990 within 1 mile of extension terminal	Ordinal	C																
b. Net change in RTTPP I projected attractions with an extension	Ratio; trips	+74																
c. Development potential near extension terminal	Ordinal	C																
13. Objective: Maximize Compatibility with Existing General Plans																		
a. Degree of conflict with existing general plans	Ordinal			D		E		E		D		D		D		D		D
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions																		
a. Available capacity on existing line	Ordinal	E																
b. Compatibility with transfers to a bus system	Ordinal	C																
c. Compatibility with transfers to a rail system	Ordinal	B																

[a] 1980 tributary population (approximately 2-1/2 miles).

[b] 1990 tributary population (approximately 2-1/2 miles).

BROWN LINE EVALUATION (San Ramon Corridor 27.3 Miles)

Judgment Measures On An Ordinal Scale:

A--100% or exceptional; B--excellent; C--good, better than; D--average, workable, acceptable; E--fair, less than; F--poor; G--none.

	Scale; Unit of Measurement	Total Summary	Link	Walnut Creek Station C	Link	Rudgear Road Station	Link	Stone Valley Road Station	Link	Danville Station	Link	San Ramon Station	Link	Dublin Station A	Link	Pleasanton Station F	Link	Livermore Station L	Link	Livermore Station O
1. Objective: Minimize BART Construction and Operating Costs																				
b. Total capital cost	Ratio; million $ 1972	344																		
2. Objective: Maximize BART Usage																				
a. Population potential within 1,500 ft. of stations	Ratio; persons	24,380		100		4,000		200		2,100		500		1,300		4,680		4,100		7,500
b. Population 1980 within 1 mile service area from stations	Ratio; persons	132,100		7,200[a]		21,000[a]		13,100[a]		16,000[a]		11,500[a]		20,000		8,400		23,700		11,200
c. Population potential within 1 mile service area from stations in addition to Criterion b	Ratio; persons	76,500		9,100[b]		11,400[b]		22,300[b]		20,100[b]		3,400[b]		3,500		2,800		700		3,200
d. Accessibility of stations to 1980 population within 8 minutes driving time	Ratio; index = population ÷ driving time to station	34		n.a.		n.a.		n.a.		n.a.		n.a.		n.a.		24		93		20
e. Existing and potential employment 1972	Ratio; persons	6,190		5,050		0		0		20		200		100		0		800		20
within 1,500 feet of stations (1990)	Ratio; persons	(27,570)		(20,000)		(0)		(0)		(20)		(2,000)		(150)		(1,800)		(1,600)		(2,000)
f. BART patronage projections, 1980	Ratio; total trips	22,660																		
g. Average travel time for Valley BART patrons	Ratio; minutes	40.54																		
h. Suitability to serve young, old, poor, and disabled	Ordinal			G		F		G		G		F		E		G		D		F
4. Objective: Avoid Change in Developed Residential Neighborhoods																				
a. Proximity of stations to existing development	Interval; index increases with distance	17		0		0		0		0		100		0		14		0		38
b. Propensity for change in neighborhoods near BART stations	Interval; index decreases with acreage subject to change	62		100		46		39		3		66		53		95		56		98
c. Line displacement	Ratio; residences	89	68	4		0		0		0		0		0		0		17		
	Ratio; businesses	15	5	0		0		0		0		0		0		0		10		
d. Access to station site	Ordinal			B		C		C		C		B		B		B		B		D
e. Station displacement	Ratio; residences	28		0		5		0		23		0		0		0		0		0
	Ratio; businesses	1		1		0		0		0		0		0		0		0		0
5. Objective: Maximize Environmental Compatibility																				
a. Noise levels	Ordinal; rank based on linear feet			E		A		A		A		D		F		F		B		B
b. Visual and physical fit	Ordinal		E	B	B	E	E	E	E	D	D	D	C	D	C	E	D	D	E	E
c. Urban design potential	Ordinal			A		E		E		E		E		E		C		D		F
6. Objective: Minimize Inequities Created by a BART Extension																				
a. Displacement by stations and routes	Ratio; residences	117	68	0	4	5	0	0	0	23	0	0	0	0	0	0	0	0	17	0
	Ratio; businesses	16	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0
7. Objective: Preserve Maximum Open Space																				
a. Population potential within 1,500 ft. of stations	Ratio; persons	24,380		0		4,000		200		2,100		500		1,300		4,680		4,100		7,500
b. Population potential within 1 mile service area from stations	Ratio; persons	208,600		16,300[b]		32,400[b]		35,400[b]		36,100[b]		14,900[b]		23,500		11,200		24,400		14,400
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line																				
a. Net change in jobs projected in 1990 within 1 mile of extension terminal	Ordinal	C																		
b. Net change in RTTPP I projected attractions with an extension	Ratio; trips	+74																		
c. Development potential near extension terminal	Ordinal	C																		
13. Objective: Maximize Compatibility with Existing General Plans																				
a. Degree of conflict with existing general plans	Ordinal			C		E		E		E		D		D		D		E		D
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions																				
a. Available capacity on existing line	Ordinal	E																		
b. Compatibility with transfers to a bus system	Ordinal	C																		
c. Compatibility with transfers to a rail system	Ordinal	B																		

[a] 1980 tributary population (approximately 2-1/2 miles).

[b] 1990 tributary population (approximately 2-1/2 miles).

TABLE 17: SUMMARY EVALUATIONS

Judgment Measures On An Ordinal Scale:

A--100% or exceptional; B--excellent; C--good, better than; D--average, workable, acceptable; E--fair, less than; F--poor; G--none.

	Scale; Unit of Measurement	Dublin Canyon Lines: Red	Green	Blue	San Ramon Valley Lines: Yellow	Brown	Orange
1. Objective: Minimize BART Construction and Operating Costs							
*a. Total capital cost per passenger	Ratio; thousands $ 1972	$ 8.7	$ 8.5	$ 9.1	$ 13.5	$ 15.2	$ 14.6
*b. Total capital cost	Ratio; thousands $ 1972	$239,000	$235,000	$250,000	$305,000	$344,000	$331,000
RANK		2	1	3	4	6	5
2. Objective: Maximize BART Usage							
a. Population potential within 1,500 ft. of stations	Ratio; persons	24,390	23,140	22,560	23,630	24,380	22,200
b. 1980 tributary population	Ratio; persons	87,600	96,900	97,900	136,500	132,100	155,400
c. Tributary population potential 1980-1990	Ratio; persons	27,400	17,300	16,800	68,900	76,500	62,000
e. Existing and potential employment 1972	Ratio; persons	350	1,120	1,140	4,370	6,190	4,260
within 1,500 feet of stations (1990)	Ratio; persons	(8,400)	(9,900)	(9,100)	(13,920)	(27,570)	(22,620)
*f. BART patronage projections, 1980	Ratio; total trips	27,582	27,582	27,582	22,660	22,660	22,660
*g. Average travel time for Valley BART patrons	Ratio; minutes	36.92	37.00	37.45	40.14	40.54	41.18
h. Suitability to serve young, old, poor, and disabled	Ordinal	F	F	E	F	F	E/F
RANK		3	1	2	6	4	5
4. Objective: Avoid Change in Developed Residential Neighborhoods							
a. Proximity of stations to existing development	Interval; index increases with distance	14	12	10	20	17	17
b. Propensity for change in neighborhoods near BART stations	Interval; index decreases with acreage subject to change	56	62	63	59	62	64
*c. Line displacement	Ratio; residences	147	70	70	105	89	101
	Ratio; businesses	7	11	11	6	15	16
*d. Access to station site	Ordinal	B-	C	B-	B	B-	B
*e. Station displacement	Ratio; residences	54	54	54	23	28	55
	Ratio; businesses	7	7	7	1	1	0
RANK		6	4	5	1	2	3
5. Objective: Maximize Environmental Compatibility							
a. Noise levels	Interval; index increases with linear feet of exposure	49	21	0	45	36	8
*b. Visual and physical fit	Ordinal	D	D	D	D	D-	D
c. Urban design potential	Ordinal	D	D	D	E	E	E
*e. Disturbance of land forms, vegetation, waterways, wildlife	Rank	1	1	1	2	2	2
f. Geologic hazards	Interval; index decreases with linear feet of exposure	10	9	0	22	21	29
RANK: Natural Environment		1	2	3	5	6	4
RANK: Urban Environment		1	3	5	2	4	6
6. Objective: Minimize Inequities Created by a BART Extension							
*a. Displacement by stations and routes	Ratio; residences	201	124	124	128	117	156
	Ratio; businesses	14	18	18	7	16	16
RANK		5	2	2	3	1	4
7. Objective: Preserve Maximum Open Space							
a. 1980 tributary population	Ratio; persons	24,390	23,140	22,560	23,630	24,380	22,200
b. 1990 tributary population	Ratio; persons	115,000	114,200	114,700	205,400	208,600	217,400
RANK		1	1	1	2	2	2
11. Objective: Maximize Economic Development at Point of Connection to Existing BART Line							
*a. Net change in jobs projected in 1990 within 1 mile of extension terminal	Ordinal	E	E	E	C	C	C
*b. Net change in RTTPP I projected attractions with an extension	Ratio; trips	+313	+313	+313	+74	+74	+74
*c. Development potential near extension terminal	Ordinal	E	E	E	C	C	C
RANK		2	2	2	1	1	1
13. Objective: Maximize Compatibility with Existing General Plans							
a. Degree of conflict with existing general plans	Ordinal	D	D	D	D	D-	D-
RANK		1	1	1	1	2	2
14. Objective: Maximize Compatibility with Existing BART System and with Other Potential Transit Extensions							
*a. Available capacity on existing line	Ordinal	C	C	C	E	E	E
*b. Compatibility with transfers to a bus system	Ordinal	B	B	B	C	C	B
*c. Compatibility with transfers to a rail system	Ordinal	B	B	E	C	C	D
RANK		1	2	3	5	5	4

* Primarily for corridor comparison.

APPENDIX C

ABSTRACTS OF PRELIMINARY STUDY REPORTS

Issues

In this report, the issues that have a bearing on the extension of BART rail rapid transit service to Livermore and Pleasanton are identified. Growth and the environmental impact of BART-related growth are described as the principal issues in the Valley. To provide a yardstick against which these impacts would be measured, three alternate population projections for the Livermore-Amador-San Ramon Valley are presented. Three possible corridor alternates also are analyzed to put the issues of transit service, cost, and impact at the point of connection in perspective. Valley and regional gains from a BART extension are outlined, and the factors affecting a choice between BART and an express bus alternative are presented. For each issue, the studies to be conducted are described in order to show the Advisory Committees and the BART Extension Board how these issues would be addressed in the planning process.

23 pages

Data

This report describes the methods used in the Livermore-Pleasanton BART Extension Study to collect, analyze, store, and retrieve data. The functions of a data bank and the particular data needs of the study are analyzed. A system of 72 Valley analysis zones and 14 corridor analysis zones compatible with the larger zones utilized by the Metropolitan Transportation Commission is presented as the basis for prediction and evaluation of BART impacts. Alternative methods of handling data are discussed, and the types of analysis to be performed are described. The appendix contains a description of the data items collected or to be collected.

32 pages

Evaluation Criteria

This report presents an evaluation process to measure the differences among alternative BART extensions to Livermore and Pleasanton. A seven step evaluation schedule is described as a means of eliminating alternatives progressively as studies become more refined and permitting separation of corridor analysis from Valley route and station analysis. Only in the final phase of evaluation is the express bus alternative compared with the selected BART route. Fourteen planning objectives are listed separately, and one to eight criteria that are used to determine the extent to which a BART alternate complies with each objective are defined. Some of the objectives necessarily conflict, and the need for trade-off analysis is discussed. To illustrate the evaluation procedure, a hypothetical example comparing two routes is included with the measures grouped under four categories: growth, BART costs, traveler benefits, and community impacts (with separate summations for the urban and natural environments).

96 pages

Preliminary Alternatives

In this report, six alternate lines providing BART service to Livermore and Pleasanton are described along with an explanation of the basis for their selection and reasons for rejecting other alternatives. Preliminary information on local and regional development impact of a BART extension and patronage also is presented. The choice of concentration of dispersion of employment within the San Francisco Bay region and the impact of alternate BART access corridors to the Valley is discussed. Valley development alternatives with and without BART are examined, including the concept of a transit-oriented new community. The procedure used to develop the six BART corridor routes, 49 potential station sites, and two dozen Valley links is summarized, and preliminary evaluations for 9 of the 14 planning objectives are presented. Corridors and Valley lines are ranked separately.

102 pages

A Survey of Household Reactions to BART Alternatives in the Communities of Castro Valley, Danville/Alamo, Dublin, Livermore, Pleasanton, San Ramon. Gruen Gruen + Associates

This report summarizes the results of a community telephone survey of 383 households designed to ascertain the reactions to BART route and station alternatives, BART-bus connections, and potential development impacts. On the basis of 34 questions, 38 statistical tables are presented to illustrate the findings about household characteristics and travel patterns, commute and non-commute trips, local bus service options, substitutability of bus service for a BART extension, attitudes towards BART and potential BART impacts on the community, and route and station location issues. The survey methodology is explained, and the statistical significance of the results is analyzed.

56 pages

Final Alternatives

This report presents information necessary to allow choice of the best BART route to serve Livermore and Pleasanton. Two corridor routes leading to the Valley and three Valley routes are analyzed as final alternatives, with Valley stations and line segments evaluated in greater detail than corridor stations, pending selection of one corridor. Preliminary patronage projections from the Regional Transit Travel Projections Project are presented and the impact of BART operations policy on extension service is discussed. In the Dublin Canyon and San Ramon corridors, alignment alternatives as well as station alternatives are analyzed. Schematic station plans are presented for all corridor and Valley stations except those in Castro Valley. Corridors are compared in terms of capital costs, BART operating costs and revenues, regional development impact, traveler benefits, and impacts on the urban and natural environments. Valley line segments are compared in terms of capital costs, traveler benefits, noise, disruption and displacement, visual quality, local government costs, historic site impacts, geologic factors, natural environmental impact, and recreation trail impacts. Detailed evaluation tables for all six lines are included.

105 pages

Recommended Route

This report presents the consultants' recommendation of a single BART route extension to the Livermore-Amador Valley, vertical alignment, and station location plan. The report summarizes the evaluations of the alternative BART extensions in the Final Alternatives report and the public responses to these alternatives at public hearings held in Danville, Castro Valley, Livermore, and Pleasanton. The Dublin Canyon corridor and the southern Valley route through downtown Pleasanton and Livermore are recommended with a subway alignment through Pleasanton and an at grade alignment through Livermore. Reasons for selecting these alternatives over all others are presented.

4 pages

APPENDIX D

CHRONOLOGY OF STUDY

October 1971 — Livermore-Amador Valley Transportation Needs Study is completed. Study recommended three types of bus services:

- Express buses to BART rail line
- Local bus routes
- Subscription bus service to Lawrence Radiation Laboratory and Sandia Corporation

September 1971 — Livermore-Pleasanton BART Extension Project and Board of Control is created.

June 1972 — Consultant team of Livingston and Blayney, DeLeuw, Cather & Company and associated firms is selected, and work begins on study.

August 1972 — Citizens Advisory Committee for extension project is created.

October 1972 — Issues report is published.

December 1972 — Data report is published.

January 1973 — Regional Transit Travel Projections Project/Task I patronage forecasts are completed.

February 1973 — Telephone survey of 400 households is conducted.

March 1973 — Evaluation Criteria report is published.

March 1973 — Preliminary Alternatives report is published.

April 1973 — Alternatives are reduced from 6 lines in 2 corridors to 3 Valley lines and 2 corridors by Project Board of Control.

January 1974 — Final Alternatives report is published and public meetings held in Livermore, Pleasanton, Castro Valley and Danville.

February 1974 — Regional Transit Travel Projections Project/Task III patronage forecasts are completed.

March 1974 — Project Board of Control selects route and stations for BART extension to Livermore.

August 1974 — Patronage forecasts for Bus Alternative are completed.

November 1974 — Implementation program is completed.

March 1975 — Draft Final Report and draft Summary are published and public meetings are held.

APPENDIX E

COMMENTS

LIVERMORE-PLEASANTON BART E
800 MADISON STR
OAKLAND, CALIFORNIA
MINUTES

PUBLIC MEETING ON DRAFT
TUESDAY, APRIL 29, 197
SHANNON CENTER,

The meeting was jointly chaired by Robert
Board of Control and John Flaherty, represen
Agencies (COVA). After introductory remark
followed by a presentation on the report.
Michael Dyett representing the project
the presentation, a number of questions
audience.

Mr. Allen raised the possibility of shorte
Pleasanton, reducing the cost to about $10
of Pleasanton objected to this stating that
all, it should be built for the full distan

Mrs. Johnson of Pleasanton stated that sin
have been paying BART taxes they ought to
asked how transit would help her get to he

Mr. Goode replied that the plan for transit
bus service between Pleasanton and Fremont

Mrs. LeClair, Councilwoman from Pleasanton,
effect of BART and cited the experience in
where BART stimulated growth.

Mr. Dyett replied that if a widened Highway
on growth will be minimal. He noted that
County was constrained by tunnels and that
This same situation does not exist with the
Mr. Dyett further added that he felt that
by local government actions rather than tra

Mrs. Raymond of Livermore said that the bus
in terms of what could actually be accomplis

Mr. Dyett stated that it appeared important
reach a concensus about what they wanted as
desires.

Mrs. Johnson of Pleasanton asked about shut
buses. Mr. Dyett replied that 12 years ago

Mr. Bailey of Pleasanton stated that the Va
extension, one which would have a direct co
at Bayfair.

APPENDIX E

COMMENTS

LIVERMORE-PLEASANTON BART EXTENSION BOARD
800 MADISON STREET
OAKLAND, CALIFORNIA 94607

MINUTES

PUBLIC MEETING ON DRAFT FINAL REPORT
TUESDAY, APRIL 29, 1975 - 8:00 P.M.
SHANNON CENTER, DUBLIN

The meeting was jointly chaired by Robert Allen, Chairman of the Project Board of Control and John Flahey, representing the Congress of Valley Agencies (COVA). After introductory remarks, a film on BART was shown followed by a presentation on the report. The presentation was made by Michael Dyett representing the project consultants. Upon conclusion of the presentation, a number of questions and comments were offered by the audience.

Mr. Allen raised the possibility of shortening the line to terminate in Pleasanton, reducing the cost to about $190 million. Mr. Ken Bailey of Pleasanton objected to this stating that if the line is to be built at all, it should be built for the full distance.

Mrs. Johnson of Pleasanton stated that since the people of the Valley have been paying BART eaxes they ought to get an extension. She also asked how transit would help her get to her job in Fremont.

Mr. Goode replied that the plan for transit service to the Valley included bus service between Pleasanton and Fremont by way of Highway I-680.

Mrs. LeClair, Councilwoman from Pleasanton, asked about the growth inducing effect of BART and cited the experience in Central Contra Costa County where BART stimulated growth.

Mr. Dyett replied that if a widened Highway I-580 is assumed, BART impact on growth will be minimal. He noted that highway access from Contra Costa County was constrained by tunnels and that BART added additional capacity. This same situation does not exist with the Livermore-Pleasanton area. Mr. Dyett further added that he felt that local growth would be controlled by local government actions rather than transportation investments.

Mrs. Raymond of Livermore said that the bus systems appeared more realistic in terms of what could actually be accomplished.

Mr. Dyett stated that it appeared important for the citizens of the Valley to reach a concensus about what they wanted and then let BART and MTC know their desires.

Mrs. Johnson of Pleasanton asked about what life span had been assumed for buses. Mr. Dyett replied that 12 years was used.

Mr. Bailey of Pleasanton stated that the Valley should aim for a full BART extension, one which would have a direct connection rather than a transfer at Bayfair.

PUBLIC MEETING ON DRAFT FINAL REPORT
April 30, 1975 - 8:00 p.m.
Granada High School, Livermore

The meeting was jointly chaired by Helen Tersell, representing the Congress of Valley Agencies, and Robert Allen of the project Board of Control. Michael Dyett representing the consultant, presented an overview of the Final Report. His presentation was followed by a series of questions and comments which are summarized below.

-Could the BART line be extended to Springtown at some future time?
-What is the maximum grade for BART?
-What if I-580 is not reconstructed?
-What is a reversible busway?
-What about a station at Chabot College?
-Who would pay for the local feeder service?
-What about the San Ramon Valley alternative?
-Could the existing SP track in San Ramon Valley be used?
-How much electricity does a BART train use?
-Does the annual cost figure include capital costs?
-What about a bus alternative without special right-of-way with buses in mixed traffic?
-Population estimate is too high
-Against rail system and in favor of buses
-Does rail cost include operating cost for local bus system?
-Does MTC have power over the level of bus service to Valley?

Attendance at the meeting was approximately 25.

PUBLIC MEETING ON DRAFT FINAL REPORT
8:00 p.m.
May 13, 1975
Earl Warren School, Castro Valley

The meeting was jointly chaired by Joseph Bort and Robert Allen, both members of the project Board of Control. Michael Dyett, representing the project consultant, made a brief presentation on the extension project and a more detailed discussion of the proposed Castro Valley station site.

About 160 people attended the meeting, primarily from the neighborhood at the proposed station site. Reaction to the proposed Castro Valley station fell into three general categories:

1. Have no station at all
2. Put the station somewhere else
3. Agree with proposed site

It appeared that the bulk of the people attending thought there should be station but at some other location. The main reason for this feeling was a reaction to residential displacement. Those who would be nearby were also concerned about increased traffic on local streets.

Suggestions for alternate station sites include telephone company land to the west and vacant areas in the east end of the valley. Several people felt that the small size of Castro Valley made it easy for people to get to station wherever it would be located.

Residents also expressed concern about the impact of the station proposal on their property values and residents' plans for improvements. They asked that the situation be clarified as soon as possible so that the element of uncertainty would be removed.

WILSEY & HAM

Earl P. Wilsey (1892-1957)

1035 EAST HILLSDALE BLVD. • FOSTER CITY, CALIFORNIA 94404 • Telephone (415) 349-2151

RONALD T. CALHOUN
Vice President

1-2332-0110-30

April 29, 1975

Livermore-Pleasanton BART Extension
Board of Control
800 Madison Street
Oakland, CA 94607

Attn: Mr. Howard Goode

Dear Board Members:

This letter, regarding the Draft Final Report for the Livermore-Pleasanton BART Extension Study, is being submitted on behalf of Mr. Harlan Geldermann, sponsor of the Las Positas New Town,

A few introductory remarks concerning the New Town planning program would seem appropriate in order to place some perspective on the relationship of the New Town to the analyses and proposals contained in the Draft Final Report. Initial environmental analyses and planning studies for the New Town were initiated early in 1973. Following extensive public hearings by the Alameda County Board of Supervisors and Planning Commission in 1974, the Board of Supervisors adopted the Las Positas General Plan Amendment, effective January 1, 1975. Adoption of the General Plan Amendment was predicated on subsequent submittal of a Specific Plan and programs conforming with certain policy requirements established by the Board of Supervisors. The Specific Plan planning process is now underway.

Integration of transportation systems and community development has been a significant determinant of the relatively high density, compact, multi-use town core surrounding a proposed transit station. High density housing, industry, and retail-office-administrative functions are all clustered within reasonable walking distance of the station. A scheduled and/or demand-activated transit system for in-town movements would be linked with regional and local transit systems.

With respect to the Draft Final Report itself, we would offer the following comments and suggestions:

1. On the basis of the comprehensive analyses contained in the Draft Report and the need for effective transit service to the Valley, we would fully support the proposed Livermore-Pleasanton BART rail system. While we are prepared to respond to the detailed proposals contained in the Draft Report, we would urge that the Livermore-Pleasanton BART Extension Board of Control move forward with adoption of a rail extension route.

2. We would agree with the authors of the Draft Report that "...a policy of no action would run counter to the public interest". Consequently, if it is determined by the Board of Control or MTC that a BART rail system extension would have a low regional priority in terms of future implementation, we would urge that, as an alternative, the current express bus system be expanded to provide transit service to the Valley.

3. Regardless of decisions which may be made with regard to future transit system modes, the Las Positas New Town should be carefully considered in future transit planning programs. As indicated previously, the New Town plan provides for a station within the Town Core which could be utilized as either a future BART rail station or a bus system park-ride lot. The New Town plan offers sufficient flexibility to accommodate alternative rail alignments or alternative linkages between the intracommunity system and the future regional system. Clearly, the New Town would provide an opportunity to achieve a new community with maximum orientation to transit so long as an effective level of coordination between transit planning and the New Town program can be attained. We are prepared to make a full commitment to the achievement of optimum integration of New Town and regional transit system planning.

In conclusion, let us extend our congratulations to the Board of Control, the Citizens Committee, the Technical Advisory Committee, and the participating consultants for their efforts in developing the analyses contained in the Draft Final Report. It constitutes a major first step in establishing a much needed transit system for the Valley.

Once again, the sponsor of the Las Positas New Town offers his full cooperation in implementing the system.

Very truly yours,

WILSEY & HAM

Ronald T. Calhoun
Vice President

RTC/dar

cc: Mr. Harlan Geldermann - Las Positas Land Co.
Mr. John K. Smith - Haley, Schenone, Tucker, Birchfield & Smith

CITY of [illegible]
2250 FIRST STREET • [illegible]

BART Board of Directors
800 Madison
Oakland, CA 94607

Dear Directors:

The draft of the Final Report
BART Extension study has be
Livermore, Pleasanton and
hearings held on the subject
sentatives of the respective
rail route and station locat
would provide the valley
rail service.

However, the report offers
more-Amador Valley a perman
alternative was discussed
duction of cost compared to
rail system.

The residents of the valley
District for over 17 years
of approximately 10 million
through sales tax increment
of our taxpayers that they
a rail transportation system
tor of the District is pres
buses and more particularly
provide interim rapid transit
acceptable as a permanent

The capital cost of the liv
estimated to be $370 million
present population numbers
may not justify an early
eventually, not only should
vided with rail service, but
done at no supplementary
cost must be a District-wide
Pleasanton area must not be
high share of that

As stated in the report, it
ten years before the valley
however, Livermore and Pleas
Express Bus Service be pro
extension can be completed.

Edward Kinney, Mayor
Pleasanton

Archer Futch, Mayor
Livermore

John D. Murphy, Supervisor,
1st District

CITY of LIVERMORE
2250 FIRST STREET • LIVERMORE, CA. 94550 • (415) 447-2100

14 May 1975

BART Board of Directors
800 Madison
Oakland, CA 94607

Dear Directors:

The draft of the Final Report on the Livermore-Pleasanton BART Extension study has been reviewed by the staffs of Livermore, Pleasanton and Alameda County and the various hearings held on the subject have been attended by representatives of the respective jurisdictions. The proposed rail route and station locations, as shown in the report, would provide the valley community with satisfactory BART rail service.

However, the report offers as an alternative to the Livermore-Amador Valley a permanent Express Bus service. This alternative was discussed because of the substantial reduction of cost compared to the cost of implementing the rail system.

The residents of the valley have been paying into the BART District for over 17 years which is a total contribution of approximately 10 million and in addition 4 million dollars through sales tax increment. It is the strongly held view of our taxpayers that they are entitled to the benefits of a rail transportation system just as any other taxable sector of the District is presently being so served. Although buses and more particularly the special bus corridors can provide interim rapid transit for the valley, this is not acceptable as a permanent substitute for the rail facility.

The capital cost of the Livermore-Pleasanton Extension is estimated to be $370 million. It is fully realized that present population numbers and the attendant economics may not justify an early rail line extension. However, eventually, not only should our valley community be provided with rail service, but equity demands that such be done at no supplementary cost to our area. The capital cost must be a District-wide obligation and the Livermore-Pleasanton area must not be required to bear a proportionally high share of that cost.

As stated in the report, it will obviously be at least ten years before the valley can expect BART rail service, however, Livermore and Pleasanton expect that the best BART Express Bus Service be provided the valley until the rail extension can be completed.

Edward Kinney

Edward Kinney, Mayor
Pleasanton

Archer Futch

Archer Futch, Mayor
Livermore

John D. Murphy

John D. Murphy, Supervisor,
1st District

San Ramon Homeowners Association

P.O. BOX 54 SAN RAMON, CALIFORNIA 9458

May 20, 1975

Robert S. Allen, Director
Bay Area Rapid Transit District
Livermore-Pleasanton BART Extension Board
800 Madison Street
Oakland, California, 94607

Dear Mr. Allen:

Our Association has a continuing concern for the mass transportation needs of the community of San Ramon. We appreciate the interest and cooperation that you have shown in this matter.

At this time, it appears unlikely that BART rail service will ever pass through our community, and so we therefore concentrated on the proposed bus routes when we first reviewed the Livermore-Pleasanton BART Extension Study. One of our Directors attended the April 29th meeting at Shannon Center, prepared to suggest some improvements in the routing of the Bus Alternative, and in the local feeder bus routes.

However, while at the meeting, she realized that the comments she had prepared were more detailed than the type of input that BART was seeking at that time, and so she withheld her comments. So that we might provide the kind of input you are seeking now, at our May 8th meeting, the S.R.H.A. Board of Directors discussed the major issue of rail vs. bus service through the Dublin corridor. The purpose of this letter is to inform you of our recommendations.

Our Board came to the unanimous opinion that the Dublin corridor should be served by a Bus, not a Rail Line.

The principal reason for our conclusion is the much lower capital cost of the Bus Line. We feel that it is extremely unlikely that the difference in operating deficit between the buses and trains will ever compensate for the large difference in first costs ($370 M for trains vs. $123 M for buses). In addition, we have more confidence at this time in estimates of future bus system costs than of future rail system costs, leading us to suspect that there may actually turn out to be a wider spread in first costs than now postulated.

A second important consideration in preferring the Bus System is its flexibility; routes can be modified to respond to changing needs. An important example of this flexibility is brought out below, in a discussion of Dublin-San Ramon service.

The Report claims that a major factor in the greater operating deficit for the Bus Alternative is the longer travel times involved. However, the implementation of the three possibilities referred to on Page 101 (4th paragraph) would remove most of the time penalty for the Bus System, and we believe further measures could be employed to remove almost all time differences between rail and bus service.

For example, let us consider the service to the Dublin-San Ramon area. The Report makes several arguments for phasing out the Dublin park/ride lot, but misses an important point about the flexibility of the Bus System.

On page 86, next to the last paragraph, the statement is made that the Stoneridge parking lot "would be more convenient for many bus patrons arriving from Dublin and San Ramon than the Dublin park/ride lot". This statement is just not true. A glance at a map of the Dublin-San Ramon area will show that the Stoneridge lot in Pleasanton would not be more convenient for any single resident of Dublin or San Ramon. Why should Dublin-San Ramon residents have to travel in and out of Pleasanton in order to get to Hayward? Such a route introduces an unnecessary time penalty for bus travelers.

On page 94 (last paragraph), the Report gives the reasons for abandoning the Dublin lot. These revolve around the pros and cons of using either the Stoneridge lot or the Dublin lot. But the most reasonable solution, and that is to use both lots (each capable of holding 700 to 800 cars), is ignored. Using both lots will save money by not abandoning the Dublin lot and by reducing the size of the necessary Stoneridge lot, as well as result in an appreciable savings in transit time for Dublin-San Ramon patrons travelling to Bay Fair.

The only Plan change required for continued use of the Dublin lot is the modification of the Busway entry and exit (shown on P. 87) to allow access to and from the north, leading to the Dublin lot. This would require a bus overpass across the westbound lane of I-580, in addition to that across the eastbound lane, leading to the Stoneridge lot. This is the example, referred to above, of the flexibility of the Bus System. It would be impractical to fan out Bart trains both north and south from the I-580 median strip, but we believe it is a desirable alternative for the Bus System.

Patrons from the Dublin-San Ramon area would thus enjoy one-seat bus service from their local bus stop (routes Z 1 and Z 2 on pages 82 and 83, but routed through the Dublin lot rather than the Stoneridge lot) to the Bay Fair station. The time saved by not having to go south to the Stoneridge lot, together with the Bus System improvements given on Page 101 (4th paragraph), should allow Dublin-San Ramon patrons faster service to Bay Fair using the Bus System than would be possible with the Rail System.

Finally, we feel that a few comments on the local feeder-bus routes in San Ramon (Z 1 and Z 2 on pages 82 and 83) should be mentioned, even though we realize that the routes shown in the Report are very preliminary. The suggested local routes do not take into account the learning experience of the past year, involving interactions between the BART Planning Dept., the Homeowners Association, and San Ramon residents, in establishing the BART bus routes in service now, and those planned for the immediate future. Several comments are appropriate: local residents have expressed their desire for the bus to travel along San Ramon Valley Blvd. between Alcosta Blvd. and Pine Valley Road, rather than on Davona Drive and Tareyton Avenue; Tareyton Avenue will soon be extended to Montevideo Drive, allowing the buses to travel along Tareyton Avenue between Pine Valley Road and Montevideo Drive; now that sewer connection constraints have been removed, rapid development is very probable along the length of Montevideo Drive (economic conditions permitting), making it likely that this area will be well populated by the time the Bus System is completed; these considerations lead to our recommendation to combine the Z 1 and Z 2 proposed routes into a single closed loop, travelling around Montevideo Drive and returning to the Dublin lot, and providing local residents with more evenly-spaced service using the same number of buses.

We appreciate this opportunity to provide input on these transportation plans, and look forward to continued fruitful interactions in the future.

Sincerely,

Michael Wahlig

Michael Wahlig
President

MW:jw
cc: Howard Goode

BAY AREA AIR POLLUTION CONTROL DISTRICT

June 10, 1975

W. F. Hein
Livermore-Pleasanton BART Extension
800 Madison Street
Oakland, California 94607

Re: Livermore-Pleasanton BART Extension
Study Draft Final Report

Dear Mr. Hein:

Following are the BAAPCD's comments on the above-referenced report.

The San Francisco Bay Area is a region severely impacted by air pollution. In formulating plans and making decisions regarding transit in the region, air quality implications must be considered as crucial determinants. This is especially true of the Livermore-Pleasanton area, which is one of the most heavily polluted sub-areas in the region, notably with respect to photochemical smog (oxidant).

The subject report is somewhat unclear and inconsistent regarding the possible air quality impacts of the proposed BART extension. On p. 67 of the report, the statement is made that until a discrepancy in modelling forecasts is resolved, "it will not be possible to be reasonably certain whether BART would induce development and/or increase total travel to such an extent that it would increase total emissions, thereby interfering with efforts to achieve and maintain air quality standards." Thus, the possibility exists that BART could have a negative net impact on regional and local air quality. This important point should be clearly stated and emphasized in the report.

However, in the Summary of the report (which probably receives the most attention by decision-makers and the public) this possible detrimental impact on air quality is not referred to. The statement is made on p. 3 of the Summary that "The conclusion was that BART could bring moderate, but significant reductions in the amount of land urbanized and in the use of automobiles." Earlier in the same paragraph, the concern of the valley's residents about air quality and growth issues is mentioned, but the important possibility that the BART extension could negatively impact air quality is not stated.

In our opinion, both the study report and Summary should objectively and candidly deal with the possible serious air quality impacts of a BART extension in the valley.

In addition, comparison of the proposed BART extension with the Bus Alternative should recognize explicitly the air quality implications of the statement on p. 103 that "Because fewer people would use buses than would use BART, the growth-inducing impact would be less than that estimated for BART." Such explicit recognition would appropriately be included under "Air Quality" on p. 104 and in the Summary (pp. 6 & 7). Assuming that "express bus service between Livermore and Bay Fair could handle maximum anticipated travel demand" (Summary, p. 6), it might not be necessary to run the risk that a BART extension will result in worsened air quality because of its growth-inducing impact.

The fact that a Bus Alternative could be in service 2 to 3 years earlier than BART (Summary, p. 7) should not be ignored. Valley air pollution is a critical problem right now and will remain especially critical during the next five to ten years. From the air quality standpoint, any significant time acceleration in the provision of regional transit to the Livermore Valley should be encouraged.

Please contact me if you have any questions regarding these comments.

Sincerely yours,

Milton Feldstein
Deputy Air Pollution Control Officer

MF:g

The "HEART" of Good Living

Castro

OFFICERS AND EXECUTIVE COMMITTEE
BETTY ANNABLE President
CHET ROBERTSON First Vice President
BEN GURULE Second Vice President
TOM HERTLEIN Secretary
RALPH RUNAVAAR Treasurer
HAROLD DEPUE Board Representative
ARTHUR EMMES Board Representative
JACK HARRISON Past President
DIRECTORS
ERNEST DAUGHTREY
MARK FOXWORTHY
LOU FRANK
PAUL HULTEN
E. A. LUCKE
ROBERT NATHANSON
DOROTHY SHERMAN
ROSEMARY SMITH
OSCAR STARK
LARRY TODD

Joseph P. Bort
Alameda County Board
1221 Oak Street
Oakland, California

Dear Supervisor Bort:

This is to advise
meeting of the Castro
policy regarding a BA

"That the Castro Vall
strongly supporting a

I know that there
Board of Supervisors
regards to the locati
is the feeling of the
definite stand in thi
attempt to have one o
hearings regarding th
further help, please

BA:srs

Castro Valley Chamber of Commerce

The "HEART" of Good Living

3484 VILLAGE DRIVE · · CASTRO VALLEY, CALIFORNIA 94546
Telephone (415) 537-5300

June 16, 1975

OFFICERS AND EXECUTIVE COMMITTEE
BETTY ANNABLE, President
CHET ROBERTSON, First Vice President
BEN GURULE, Second Vice President
TOM HERTLEIN, Secretary
RALPH RUNAVAAR, Treasurer
HAROLD DEPUE, Board Representative
ARTHUR EMMES, Board Representative
JACK HARRISON, Past President
DIRECTORS
ERNEST DAUGHTREY
MARK FOXWORTHY
LOU FRANK
PAUL HULTEN
E. A. LUCKE
ROBERT NATHANSON
DOROTHY SHERMAN
ROSEMARY SMITH
OSCAR STARK
LARRY TODD

Joseph P. Bort
Alameda County Board of Supervisors
1221 Oak Street
Oakland, California 94612

Dear Supervisor Bort:

This is to advise you that at the regular Board of Directors meeting of the Castro Valley Chamber of Commerce the following policy regarding a BART station in Castro Valley was adopted.

"That the Castro Valley Chamber of Commerce go on record as strongly supporting a BART station in Castro Valley."

I know that there is considerable concern on the part of the Board of Supervisors regarding some community expressions in regards to the location of a BART station in Castro Valley. It is the feeling of the Chamber of Commerce that we need to take a definite stand in this matter and have so advised you. We shall attempt to have one or more members of our Board present at all hearings regarding this matter in Castro Valley. If we can be of further help, please do not hesitate to let me know.

Sincerely,

Betty Annable
President

BA:srs

BART
BAY AREA RAPID TRANSIT DISTRICT
800 Madison Street
Oakland, California 94607
Telephone 465-4100

June 20, 1975

RICHARD O. CLARK, PRESIDENT
ELMER B. COOPER, VICE PRESIDENT
LAWRENCE D. DAHMS, ACTING GENERAL MANAGER
DIRECTORS
JAMES D. HILL, 1ST DISTRICT
NELLO J. BIANCO, 2ND DISTRICT
RICHARD O. CLARK, 3RD DISTRICT
HARVEY W. GLASSER, M.D., 4TH DISTRICT
ROBERT S. ALLEN, 5TH DISTRICT
JOHN GLENN, 6TH DISTRICT
ELLA HILL HUTCH, 7TH DISTRICT
ELMER B. COOPER, 8TH DISTRICT
JOHN H. KIRKWOOD, 9TH DISTRICT

To: Urban Mass Transit Administration
Department of Transportation
400 Seventh Street, S.W.
Washington, D.C. 20590

Thru: Metropolitan Transportation Commission
Hotel Claremont
Berkeley, CA 94704

Subject: Livermore-Pleasanton BART Extension (LPX)
Draft Final Report

BART's $792 million bond issue package approved by the voters in 1962 promised future rail extensions (including LPX) to areas within the District not served by the initial system. I endorse in concept a BART rail line from Bayfair to the Livermore Valley in the I-580 median. This entire route lies within District 5, from which I was elected Director last November.

This Draft Final Report presents one possible route and a bus alternative. To this extent the consultants have performed their assigned task, and I reluctantly voted to accept the report. I seriously question the route, design concepts, and costs, however; hence this minority report on LPX.

Propriety and the law require full disclosure of any potential conflicts of interest. I work for Southern Pacific and own about 100 shares of SP common stock. (LPX involves SP massively from Pleasanton to the line's end.) I also own a tract home about 1/4 mile from the proposed West Livermore station. The record will clearly show, however, that I have no actual conflict of interest.

My main areas of concern:

1. Cost

$370 million for LPX! At 6 percent interest that investment would yield $22 million per year. That's interest alone--ignoring amortization, capital replacement, operating losses, etc.

Express buses now connect outlying areas to BART. The buses serve Livermore and San Ramon Valleys and the Pinole, Martinez, and Pittsburg-Antioch-Brentwood areas. BART's entire express bus program costs about $2 million a year.

Thus, interest alone on LPX would support BART's entire express bus program eleven times over! Clearly $370 million for LPX is too much.

The Tri-Valley Herald proposed bobtailing the line at the proposed Pleasanton station, near the Alameda County Fairgrounds. The consultant pegged a Bayfair-Pleasanton line at $190 million. Some interesting figures result:

Bayfair-Livermore:	$370 million;	27 mi.;	$14 million/mile
Bayfair-Pleasanton:	$190 million;	17½ mi.;	$11 million/mile
Pleasanton-Livermore:	$180 million	9½ mi.;	$19 million/mile

That last 9-1/2 miles costs so much because of a railroad relocation and subway through Pleasanton, 2 miles of aerial structure near the gravel pits, and grade separations and two stations in Livermore. The Herald's proposal--which would roughly halve the cost--appears far more realistic than that in the Draft Final Report.

Livermore's two stations would attract an estimated 18,400 patrons a day in 1990. $180 million means about $10,000 invested ($600 a year in foregone interest) per patron-day.

A joint WP-BART-SP trainway through Pleasanton and Livermore would have served the public better at far less cost. If UMTA and MTC feel a BART line through Pleasanton and to Livermore is warranted, I urge you to require it to be nested between, and on a common grade with, SP and WP tracks. The entire trainway would be grade separated. BART--which needs only 14 feet clear above T/R--could underpass SP's wye tracks at Radum.

2. Dislocation

Eighty-one homes in Castro Valley and 26 in Livermore would be displaced under LPX as proposed by the consultants. Better alternatives displacing almost nobody exist in Castro Valley. The Board of Control firmly rejected the consultant's recommendation for a Castro Valley station site.

Placing BART between the railroads would eliminate taking the homes in Livermore. The needed land would instead reduce slightly the size of BART's proposed parking lot at West Livermore. (Livermore's ill-conceived railroad relocation--CPUC App. 53846--so complicates the layout through Livermore that the Livermore-Pleasanton segment may well be unfeasible.)

3. New Town

Now in early planning stages, the proposed transit-oriented community of Las Positas Valley may be a better eastern anchor for LPX than is Livermore. Livermore is auto oriented, and poorly laid out for transit.

BART would continue east from Stoneridge, with stations near Santa Rita Road and the Livermore airport. It would then swing northeasterly across I-580 to a terminal in Las Positas Valley.

Livermore's general plan consultant has proposed a transportation center at Livermore's airport. The new town line would fit well.

Such a line would need few grade separations beyond the Stoneridge (Northwest Pleasanton) station: I-680, Hopyard Road, SP's San Ramon Branch, Santa Rita Road, El Charro Road, Kitty Hawk Road, and I-580. It would intercept I-580 traffic near the east end of Livermore Valley, follow natural barriers to development, and allow better planning for areas near the stations.

4. Shuttle Concept

BART plans to run trains on two-minute headways. Direct LPX to Daly City service would fit; the shuttle concept is not needed. Even if Oakland Airport to Concord service were added, there is enough room. Fremont-Daly City and Fremont-Richmond trains could still each run on eight-minute headways, essentially allowing train intervals of four minutes to Fremont.

Direct runs would serve the public much better. No changes to Bayfair station would be needed, as the interlocking could be south of the existing center platform. LPX entry to the 238 median should be designed first to overpass the existing BART northbound track.

5. Bus Alternative

The Draft Final Report presents an $80 million bus alternative, of which $10 million is for rolling stock. This $70 million busway hurts Dublin and San Ramon; current feeder buses serve the rest of the Valley just as well.

Except for a Bayfair connection to the Rt. 238 median, the busway alternative has no value and should be discarded. The Bayfair connection would, of course, serve many buses other than those to the Livermore Valley and is more properly an aspect of Bayfair access.

While I endorse LPX in concept, the project proposed in this Draft Final Report is grossly deficient. I would welcome a chance to discuss these issues with you in greater detail.

Very truly yours,

Robert S. Allen

Robert S. Allen
223 Donner Avenue
Livermore, CA 94550
(415) 443-0194

cc: Livermore-Pleasanton Extension
Board of Control
BART Board of Directors
Bill Hein, BART Director of Planning
Supervisor John D. Murphy
Citizens Advisory Committee
Oakland Tribune
Hayward Daily Review
The Independent (Livermore)
Valley Times
Contra Costa Times
Tri-Valley Herald
City of San Leandro

MTC Metropolitan

mem

to: Howard Goode

fr: Don Morgan

re: MTC Staff Comments on LPX

The following comments are the by the Transportation Planning Implementation Planning Divisi part, to a series of questions Additional IPD comments are als

A. TPAD COMMENTS - The comments Growth & Development, Envir Travel Issues and General I of the issues discussed und

1. Growth & Development Is

a. The section on Regio emphasis on the dev in other developmen

b. The tone of the dis regional planning i address the regiona example, instead of the impact that liv have on San Francis office centralizati centralization fro and avoids the foll accompany the relea Granted that there assessing these im for ignoring them:

i. Office commercial "SPUR Highrise

*Since this review was accomplis tion. Most former TPAD functio Most IPD functions are now perf

HOTEL CLAREMONT • BERK

Metropolitan Transportation Commission

memorandum

date: September 5, 1975
w.i.: 604-01-01

to: Howard Goode

fr: Don Morgan

re: MTC Staff Comments on LPX Draft Final Report

The following comments are the result of an extensive review of the DFR by the Transportation Planning and Analysis Division (TPAD) and the Implementation Planning Division (IPD).* The TPAD review responded, in part, to a series of questions and comments generated by IPD staff. Additional IPD comments are also included.

A. TPAD COMMENTS - The comments are grouped under four headings: Growth & Development, Environmental Impact, Transportation System & Travel Issues and General Issues. There is some inevitable overlap of the issues discussed under the separate headings.

1. Growth & Development Issues

a. The section on Regional Development issues places too much emphasis on the development of office jobs. BART's role in other development issues should be described.

b. The tone of the discussion presented in the section on regional planning issues is one which does not effectively address the regional planning issues relevant to BART. For example, instead of discussing and attempting to assess the impact that Livermore-Pleasanton BART extension would have on San Francisco due to the LPX further encouraging office centralization, the study simply discusses the office centralization trend. This approach ducks several issues and avoids the following types of negative impacts which accompany the relentless office growth in San Francisco. Granted that there is some difficulty in analytically assessing these impacts; however, there is no justification for ignoring them.

i. Office commercial space has been shown in the recent "SPUR Highrise Study" to be of very questionable value

*Since this review was accomplished, MTC has undergone a reorganization. Most former TPAD functions are now performed by "B" Section. Most IPD functions are now performed by "C" Section.

HOTEL CLAREMONT • BERKELEY, CALIFORNIA 94705 • (415) 849-3223

just in terms of the adequacy of the tax revenue it provides relative to the services it demands.

ii. Continued office development, even if served somewhat by transit, still generates added auto traffic by in-commuters to San Francisco; this traffic increases air pollution, increases noise levels, disrupts and congests neighborhood streets, and frequently results in a loss of visual amenities due to widening streets to accomodate added commuter traffic.

iii. Continued centralization of office employment will have a significant impact on the socio-economic character of San Francisco. The loss of middle income families to the suburbs as commute time is decreased does not have a positive effect on the maintenance of the city's existing housing stock. Moreover, continued emphasis on office centralization is frequently at the expense of industrial employment in the city since city policy on taxation favors the former. The employment of the office centers downtown does not favor the working class family. The jobs generally are either low paying clerical jobs which frequently discriminate against these predominantly women job holders, or they are higher paying jobs serving predominately the white middle class suburban male.

c. The validity of the Valley development alternatives will be discussed from three points of view: 1) the characterization of the population levels, 2) the relationship of the alternatives to transportation, and 3) the ultimate viability of transit.

First, the population figure of 178,000 for the Valley in 1990 is characterized as "low sharply-curtailed growth." This figure corresponds to the moderate to high growth rate associated with the GROSOUTH populations in PLUM Series II Forecasts. We now feel that what was a "low" forecast for Regional population in 1990 is more likely to be a moderate forecast due to continued low fertility and migration rates. Certainly forecast assumptions can be debated but it appears that the consultants may be using population estimates which will not be realizable.

Second, aside from the comments immediately above, the dependence of the forecasts on transportation and job location assumptions should have been spelled out more clearly so that the growth inducing effects of economic development and transportation to such development could directly be addressed. What are the transportation assumptions upon which a forecast population of 178,000 or 227,000 are based? Where

will these people work?

Third, although there is some discussion on the effect on development of the amount of transit service available, there is inadequate treatment of the effects on development patterns of varying levels of transit acceptance. Generally, it is assumed that 40% of work trips would be carried by BART, perhaps this is too high. Would a lower modal split produce similar development patterns?

d. The IPD staff has raised the question, "Would the plan for expansion of I-580 through Dublin Canyon provide sufficient capacity for 1990 without a BART extension?" In this question is the implicit assumption that the population is independent of the transportation system. This is questionable. Instead, we should say that we anticipate that with the I-580 improvements, the limited bus service and other assumptions we anticipate a 1990 population of between 160,000 and 170,000. This figure is below the levels stated in the Valley development alternatives. If BART were extended to Livermore, the total population might be higher. Also, if employment develops at a faster rate in the Valley, or in the Fremont, San Jose, Walnut Creek or Tracy areas, then the population might be higher.

2. Environmental Impact Issues

a. Socio-Economic Impacts

The report discusses in general terms most of the impacts of the rapid transit extension, except for the socio-economic impacts. How would the users, the non-users, the poor and the handicapped be impacted? The users of the transportation system could be classified into three categories: The constant transit-user, the diverted transit-user and the constant auto user. Benefits could be calculated for each category and expressed in dollars. For example, the diverted transit user could be analyzed independently by looking at travel time savings, parking cost savings, fuel savings and insurance cost savings. This analysis could then be used in the evaluation process for the third objective on page 21 - MINIMIZE TOTAL DIRECT AND INDIRECT TRAVEL COSTS. Impacts on the poor, the old, the young, the non-drivers should have been assessed. For these people the suburban patterns of development are not well served by transit. Jobs, schools, recreation and cultural opportunities are inaccessible. The report does point out in the 2nd objective on page 122, that the suitability of the selected route to serve the young, old, poor and disabled ranges from D to G on an ordinal scale of

A to G. We need to know what suitability to serve includes.

b. Growth Inducing Impacts

i. The discussion presented in the report has questionable validity. No concrete analyses are presented to support the assumptions made. Rather, assumptions are based on conjecture. Studies are mentioned and a bibliography is contained in the back of the report. However, there is no proper referencing in the discussion to the analyses and findings of such reports. What impacts related to (say) the Lindenwold line, were studied, analyzed or incorporated in this report?

ii. Another assumption made or implied on page 61 of the study is that BART will have an overall impact of reducing freeway congestion. Such an assumption is not clearly supported since the net effect of BART on freeway congestion depends on the growth inducement and the ability of the line to carry the ridership demand resulting from existing and future growth - including induced growth.

iii. The assumption that one out of four BART extension riders in 1990 would have lived elsewhere if BART were not extended is not supported. It raises a number of questions: Why one out of four? Does the 12,100 Valley out commuters in 1990 reflect BART growth inducement, and to what degree?

iv. There is a reference on page 62 that is somewhat misleading. It is stated that "an MTC study based on the premise that access constraints are the principal deterrent to Valley growth concluded that a BART extension could increase the Valley's population by 20,000. However, congestion on the main access route has not stopped growth in Marin County, Contra Costa County or San Mateo County." It should be noted that the MTC I-580 study referred to indicated that access had a major impact on growth but not that it should be anticipated that growth would stop. The reason for this is that the Dublin Canyon is a constraint only on growth resulting from economic development in the East Bay and San Francisco. Growth can continue to occur based on economic development in other areas. The same reasoning applies to Marin, Contra Costa and San Mateo Counties.

v. On page 67, it is stated that unless the discrepancy between the CALTRANS forecasts and RTTPP forecasts are resolved, there is no reasonable way to be certain whether BART would induce development. It is not clear how resolving the above issue would assist in determining the growth inducing impact of BART. The growth assumptions in the RTTPP projections were given and it would require a separate analysis to determine the growth inducing impact. The growth projections output by PLUM using the GROSOUTH assumption were modified by the consultants to reflect their assumptions of growth in the Valley. We need to know if the growth projections used were made on the basis that a higher projection is needed if an extension is being considered for the Valley. If that is the case, then the consultant has already assumed a growth inducing impact by BART. (See also a similar comment made in the Growth-Development Issues).

c. Air Quality Impacts

i. We would like to inform the study participants that MTC has developed and is in the process of improving the DIFKIN Photochemical air quality model. This model is now closer to being operational and usable for predicting potential air quality impacts of BART than are any of the models alluded to on page 65.

ii. The air quality impacts are based primarily on the work done by CALTRANS in its I-580 DEIR. That work was shown to be inadequate and the BART Extension Study should not rely on it. In particular, the Impact of growth and development in the Valley was not taken into account. The key air quality impact of BART is expected to be based on the emissions from development and intra-valley trips resulting from development that is induced by the BART extension. Furthermore, it is questionable whether BART will result in reduced auto use to and from the Valley. More likely, BART will result in additional non-auto trips to and from the Valley and additional auto trips within the Valley.

iii. Aside from the assumption that BART may actually reduce VMT, it should be mentioned that the air quality impacts by 1990 might be more influenced by emissions related to "cold starts" and "hot soaks."

Trips contributing to this do not appear to be analyzed in this study.

iv. It is questionable that the BART extension will not encourage growth in outlying areas but rather will concentrate growth around the stations. The proliferation of parking lots near existing suburban BART stations indicates that such assumptions are weak. Relative to air pollution, this factor is very important; if the BART extension generates a large number of short trips to the stations, then its effect on reducing VMT would not be very significant. Additionally, these short trips will contribute to the "cold starts" and "hot soaks" aspects of emissions mentioned above.

3. Transportation System and Travel Issues

Most of the issues raised here relating to RTTPP projections have been discussed with Howard Goode, Project Coordinator for the BART District. He has agreed to look into this matter and clear the discrepancies or provide explanations.

a. The report points out on page 6 that 36,000 Valley residents will hold local jobs. Translating this into dwelling units, using an assumption of 3 residents per dwelling unit (consultants' assumption), you have 12,000 housing units that would be generating 120,000 trips a day in the Valley (using 10 trips per housing unit as given on page 18). Total intra-valley BART patronage is given as 5000 trips per day on BART. This leaves a substantial portion of trips using other modes of transportation (auto, transit, walk, etc.). Was there any analysis done to determine what effect this amount of trips would have on the local transit and street system? Where did the trip generation rate of 10 trips per housing unit come from, and what modes does it include?

b. On page 26, the report states that about 3000 trips bound for Bay Fair station originate in Castro Valley. Does it mean in Castro Valley or at Castro Valley station? If the report is referring to BART trips, Test 2A shows that the total productions from Castro Valley station for work is 919 and non-work 494. These are total productions to all other stations on the network and thus would fall far short of the estimated 3000 trips bound for Bay Fair station. An analysis was carried out to determine the intra-valley travel patronage. Table 9 (page 26 of the report) gives the patronage as 2000 for work trips and

3000 for nonwork totalling to 5000 total trips. The following two tables show the results and what stations were considered as intra-valley. The work productions are 676 and nonwork 1642 productions. It must be noted that for work productions the return trip home is included, so the productions are total trips.

WORK TRIPS

	Dublin	Pleasanton	W. Livermore	E. Liv.	Total
Dublin N/W	0	30	40	36	106
Pleasanton	47	0	02	99	238
W. Livermore	97	114	0	14	225
E. Livermore	41	57	9	0	107
	185	201	141	149	676

NON WORK TRIPS

	Dublin	Pleasanton	W. Livermore	E. Liv.	Total
Dublin N/W	0	71	151	126	348
Pleasanton	0	0	158	167	325
W. Livermore	308	84	0	274	666
E. Livermore	185	55	63	0	303
	493	210	372	567	1642

c. In the analysis of the station plans, CALTRANS 1995 projections were utilized rather than RTTPP Task III 1990 projections to show traffic volumes on streets in the vicinity of the stations. We need to know if any attempt was made to use RTTPP highway projections. If RTTPP projections were available (as suggested by Howard Goode) we need to know why the consultant adopted CALTRANS projections.

d. The report states on page 26 that estimated 1990 highway person trips through Dublin Canyon is 101,000 with BART. This estimate does not agree with the 103,000 shown in Table 19, page 95. These figures should be made consistent.

e. In looking at the patronage in the Dublin Canyon corridor, the consultant utilized Test 2A (high growth assumption) and based the revenue calculations on this patronage. It is appropriate to estimate a range of future patronage and revenues based on a range of growth assumptions rather than rely on one assumption. Test 2B, which assumes lower growth, could be looked at for this purpose. The patronage through the Dublin Canyon for this test is approximately 28,600 compared to the 34,000 estimated in Test 2A. Revenue implications of such a lower patronage level should be included.

f. In studying the bus alternative, the study of articulated buses could have been included. One of the disadvantages of buses, particularly when passenger volumes increase, is that added passengers mean more drivers and higher costs, whereas longer trains can be operated on rail with the same number of personnel. Clearly bigger buses that would increase the passenger/driver ratio could potentially reduce costs.

g. There will be some passengers who live within walking distance of a BART station. The probability that passengers would walk to their stations will depend on various factors: competing modes, directions of routes, freedom from physical barriers and delays such as busy road crossings, safety from traffic or other hazards, and freedom from noise and fumes. Some work could have been done in this area to provide some recommendations on how to minimize some of these adverse conditions so as to encourage walking. Similarly, cycling to the stations could have been considered and encouraged as an access mode.

h. It is not clear why objective 3 in the evaluation process on page 122 is not used in the final evaluation and selection of the "blue line route" over the bus alternative.

4. General Comments

a. It is worthwhile to address a general concern about the overall approach of this study. The concern is that this study's language frequently implies that adoption of a BART line or extensive transit to the now relatively remote Livermore Valley is a given; consequently, the issue of the desirability (from a regional standpoint) of encouraging, aiding, or further accomodating urban sprawl in outlying regions of the Bay Area is never adequately addressed. Instead, this study continues in every aspect of the analysis the comparison of detailed alternatives

and frequently skirts [illegible] extension is desirable.

b. The legend for the map

c. The appendix - Data [illegible] respondence table that corresponding 290 and [illegible] to see such a table [illegible] where it can be found. [illegible] future reference to the [illegible] to the regional data [illegible]

B. IPD COMMENTS

1. The development impact [illegible] statements (e.g., a given [illegible] less land and would generate [illegible] with BART). While the [illegible] to mislead rather than [illegible] of affairs which is unlikely [illegible] concentrate instead on an [illegible] and impacts of growth induced

2. On page 27, Daly City is [illegible] at which trains could be [illegible] ence to building a fourth [illegible] Please check the validity [illegible]

3. Also on page 27, consultant [illegible] indicate that the Fremont [illegible] to handle the additional [illegible] sion." However, the DATAP [illegible] that the two Fremont lines [illegible] peak hours (using a 1.5 [illegible] Livermore extension.

4. The treatment of a "no-project" [illegible] Inadequate. The no-project [illegible] include, at a minimum, the [illegible] on exclusive bus lanes on [illegible] lities are currently either [illegible]

5. On page 107, reference is [illegible] Development Program." The [illegible] (formerly the Transit Needs [illegible] frame. The Regional Transp[illegible] estimate of regional needs [illegible]

cc: Walt Stoll
Wes Wells

DM:kd

memorandum

page: nine

date: September 5, 1975
w.i.: 604-01-01

and frequently skirts the important issue of whether the extension is desirable or not.

b. The legend for the map on page 5 is not clear.

c. The appendix - Data Zones on page 119 is missing a correspondence table that links the Study's 86 zones to the corresponding 290 and 440 zonal systems. We would like to see such a table included or a reference made as to where it can be found in other study documents so that future reference to the Study's data base can be related to the regional data base.

B. IPD COMMENTS

1. The development impact sections contain highly hypothetical statements (e.g., a given Valley population would require less land and would generate fewer VMT and traffic congestion with BART). While the statement is probably true, it serves to mislead rather than illuminate since it alludes to a state of affairs which is unlikely to occur. The report should concentrate instead on an examination of the probable extent and impacts of growth induced by a BART extension.

2. On page 27, Daly City is referred to as an intermediate point at which trains could be turned back. There is also a reference to building a fourth track through the Oakland Wye. Please check the validity of these statements.

3. Also on page 27, consultants state: "Current BART projections indicate that the Fremont line will have sufficient capacity to handle the additional patronage from a Livermore extension." However, the OATAP Plan 3 Analysis (table 3) indicates that the two Fremont lines will be at or near capacity during peak hours (using a 1.5 load factor) by 1990 without a Livermore extension.

4. The treatment of a "no-project alternative" is too brief and inadequate. The no-project alternative in this case should include, at a minimum, the BART Express Bus service operating on exclusive bus lanes on I-580, since these services/facilities are currently either operational or committed.

5. On page 107, reference is made to "MTC's 20-year Transit Development Program." The Transit Improvement Program (formerly the Transit Development Program) has a 3-year time frame. The Regional Transportation Plan has a 10-year estimate of regional needs and planned expenditures.

cc: Walt Stoll
Wes Wells

DM:kd

APPENDIX F

RESPONSE TO COMMENTS

LIVERMORE-PLEASANTON BART EXTENSION PROJECT

RESPONSE TO MTC COMMENTS ON DRAFT FINAL REPORT

A. REGIONAL GROWTH AND DEVELOPMENT

A. MTC Comment One

a. The section on Regional Development issues places too much emphasis on the development of office jobs. BART's role in other development issues should be described.

Project Response

Page 6, Draft Final Report

> The concerns in planning a Livermore-Pleasanton BART extension go beyond service to the residents of the Valley to the larger question of the effect of transit investments on the distribution of activities in the Bay Area. Rapid transit impact studies in the Bay Area and elsewhere generally have concluded the distribution of population and employment growth may be affected by a transit system, but that net new growth in a region will not be stimulated. If alternative BART choices will affect the amount of population or employment growth at locations outside the Valley, even though the magnitude may be small, the analysis should strive to identify the impacts.

The MTC comment does not suggest specific "other development issues", however pages 50 and 51 of the Regional Transportation Plan provide the following list of criteria relevant to regional impacts:

Will the proposal significantly:

1) Change growth and development in the Region, causing shifts in the level, type, density, or distribution of people, housing, and jobs?

2) Change the relative separation of jobs and housing?

3) Change the relative distribution of housing density?

Two questions seem to be involved here; first, influence on total growth of the region and second, the effect on the distribution of activities within the region. There is no evidence that a transit extension such as the Livermore-Pleasanton line would cause a net growth in the Bay Area population. If the proposed line is to have any effect at the regional level it is more likely to involve the distribution of activities.

The relevant concern then is how adequately the draft Final Report covers potential shifts in jobs, housing, etc. With respect to employment, the report notes on page 8:

> If regional policy were to discourage further intensification of development in the metropolitan core cities, BART should not have been built and should not be extended. It cannot help but favor additional development when high densities already exist. BART will cause relocation to sites near stations of some of the office development that would have occurred in outlying areas in any event, but it is unlikely to attract

> a significant amount of potential development from downtown Oakland and San Francisco to outlying BART-served locations. A decision to extend BART to Livermore and Pleasanton will not substantially alter the prevailing centralized regional office employment pattern.

The potential for shifting employment growth to Walnut Creek by means of a San Ramon Valley alignment was investigated extensively and is reported on page 75. The conclusion was that changing the BART route made little difference.

The effect on housing is noted on page 8:

> Surveys of land values and rents indicate that people are willing to pay a premium to live near a BART line. However, the characteristics of the existing land and the improvements compiled for the MTC/UC Berkeley BART residential land use impact study have been shown to explain more than 80 percent of the variance in property values, if accessibility factors are excluded. Consequently, predictions of BART impacts on outlying residential areas cannot be made with certainty. Areas that traditionally have attracted developers will be enhanced by BART, particularly if large acreages of undeveloped land still exist where new, BART-oriented development could occur.

and on page 13:

> If growth constraints were in force, a given Valley population would require less urban land and would generate fewer vehicle miles of travel and less traffic congestion with BART. New population moving into the Valley will include a larger proportion of commuters than the present population. If BART service were assured, the population would include a larger percentage of potential BART riders than the present commuting population. Without effective control of location and density of new housing, BART could result in a loss of environmental quality because the larger population attracted by BART might consume more of the Valley's air and land resources and might generate more vehicle travel than the smaller population that would have existed without BART.

Some of the characteristics of new residents are described on page 8:

> Patronage projections indicate that a Livermore Valley BART extension providing the best service to Oakland and San Francisco would attract the most riders. As well-paid office workers must travel further to find new single family homes in homogeneous communities, their automobile commute becomes more onerous and costly (or even impossible if there is a prolonged energy shortage), and they readily can be attracted to high quality transit.

The examples cited above are representative of comments contained throughout the report which all suggest the following conclusions:

a. The extension will not change total regional growth
b. The extension could not cause any significant shift in employment development
c. The extension will make the Livermore-Pleasanton area more attractive to office workers.

MTC Comment Two

b. The tone of the discussion presented in the section on regional planning issues is one which does not effectively address the regional planning issues relevant to BART. For example, instead of discussing and attempting to assess the impact that Livermore-Pleasanton BART extension would have on San Francisco due to the LPX further encouraging office centralization, the study simply discusses the office centralization trend. This approach ducks several issues and avoids the following types of negative impacts which accompany the relentless office growth in San Francisco. Granted that there is some difficulty in analytically assessing these impacts; however, there is no justification for ignoring them.

   I. Office commercial space has been shown in the recent "SPUR Highrise Study" to be of very questionable value

      Just in terms of the adequacy of the tax revenue it provides relative to the services it demands.

   II. Continued office development, even if served somewhat by transit, still generates added auto traffic by in-commuters to San Francisco; this traffic increases air pollution, increases noise levels, disrupts and congests neighborhood streets, and frequently results in a loss of visual amenities due to widening streets to accommodate added commuter traffic.

   III. Continued centralization of office employment will have a significant impact on the socio-economic character of San Francisco. The loss of middle income families to the suburbs as commute time is decreased does not have a positive effect on the maintenance of the city's existing housing stock. Moreover, continued emphasis on office centralization is frequently at the expense of industrial employment in the city since city policy on taxation favors the former. The employment of the office centers downtown does not favor the working class family. The jobs generally are either low paying clerical jobs which frequently discriminate against these predominantly women job holders, or they are higher paying jobs serving predominately the white middle class suburban male.

Project Response

Although the project has commented upon BART influence upon centralization and commuter housing selection, it refrains from drawing the implications suggested by MTC's comment. Value judgments on policies and their implications are more appropriately left for the regional planning process. A more realistic goal for a corridor study is concentration upon description of direct impacts. It should also be noted that the SPUR highrise study was published after the draft report was prepared.

B. TRANSPORTATION SYSTEM ALTERNATIVES

MTC Comment Three

4. General Comments

   a. It is worthwhile to address a general concern about the overall approach of this study. The concern is that this study's language frequently implies that adoption of a BART line or extensive transit to the now relatively remote Livermore Valley is a given; consequently, the issue of the desirability (from a regional standpoint) of encouraging, aiding, or further accomodating urban sprawl in outlying regions of the Bay Area is never adequately addressed. Instead, this study continues in every aspect of the analysis the comparison of detailed alternatives and frequently skirts the important issue of whether the extension is desirable or not.

Also,

4. The treatment of a "No
Inadequate. The no
Include, at a minimum
on exclusive bus lane
lities are currently

Project Response

The Joint Powers Ag
June 4, 1971 calls for a

2. DEFINITION

A. "Project"
the extension of BART's
in the vicinity of the
County of Alameda. Said
not be limited to recomm
of said extension and the
to serve as the basis for
when funds are available

The same section
independently developing
Regional Transportation P
Agreement have never been

While the initial
extension of BART rapid
underway changing expect
inclusion of a bus-way
and BART rail has been
plans as a base case. Th
Highway I-580 to eight
of express bus service.

During the course
Highway I-580 emerged
automobiles. This decis
BART study was completed,
issued.

The alternatives
1. No action beyond
in mixed traffic on a
2. Substantial
exclusive right-of-way

Also,

4. The treatment of a "no-project alternative" is too brief and inadequate. The no-project alternative in this case should include, at a minimum, the BART Express Bus service operating on exclusive bus lanes on I-580, since these services/facilities are currently either operational or committed.

Project Response

The Joint Powers Agreement between BART and MTC signed June 4, 1971 calls for a planning project which is defined as follows:

2. DEFINITIONS

A. "Project" - The development of a comprehensive plan for the extension of BART's rapid transit facilities to areas generally in the vicinity of the Cities of Pleasanton and Livermore in the County of Alameda. Said comprehensive plan shall include but shall not be limited to recommendations as to implementation and funding of said extension and the development of conceptual engineering plans to serve as the basis for the award of final engineering contracts when funds are available.

The same section assigns to MTC the responsibility for independently developing the mass transit segment of the Regional Transportation Plan. These portions of the Joint Powers Agreement have never been modified.

While the initial intent of the study was limited to an extension of BART rapid transit facilities, as the project got underway changing expectations for the study area prompted inclusion of a bus-way alternative. Information on the bus-way and BART rail has been developed using existing transportation plans as a base case. This base assumed reconstruction of Highway I-580 to eight lanes and maintenance of a modest level of express bus service.

During the course of the study a new configuration for Highway I-580 emerged which will reduce the capacity available to automobiles. This decision was reached after the bulk of the BART study was completed, in fact after the draft Final Report was issued.

The alternatives which are contained in the report are:

1. No action beyond maintenance of existing bus service in mixed traffic on a free flowing Highway I-580.

2. Substantial increase in bus service, operating on an exclusive right-of-way through Dublin Canyon.

3. A BART rail extension.

Addition of new alternatives at this point in the study constitutes an unfair demand on the resources of the consultant.

The comment about the "no-project alternative" deserves additional attention. Presumably it was addressed to the paragraph on page 78 entitled No-Project Alternative. This passage is intended only to call attention to no-action as an alternative. The "no-project alternative" is treated implicitly throughout the report since it is the base to which the BART rail and bus-way alternates are compared.

C. CORRIDOR GROWTH

MTC Comment Four

b. Growth Inducing Impacts

1. The discussion presented in the report has questionable validity. No concrete analyses are presented to support the assumptions made. Rather, assumptions are based on conjecture. Studies are mentioned and a bibliography is contained in the back of the report. However, there is no proper referencing in the discussion to the analyses and findings of such reports. What impacts related to (say) the Lindenwold line, were studied, analyzed or incorporated in this report?

Project Response

The Consultant states that the analysis was not based on listed studies in other areas and so they are not referenced in the text. The section on growth inducing impacts has been rewritten and can be found on pages 10, 11 and 12 of the attached report revisions.

MTC Comment Five

The assumption that one out of four BART extension riders in 1990 would have lived elsewhere if BART were not extended is not supported. It raises a number of questions: Why one out of four? Does the 12,000 Valley out commuters in 1990 reflect BART growth inducement, and to what degree?

Project Response

The one in four example is for illustration purposes and is clarified in the revision cited in the previous section.

MTC Comment Six

There is a reference on page 62 that is somewhat misleading. It is stated that "an MTC study based on the premise that access constraints are the principal deterrent to Valley growth concluded that a BART extension could increase the Valley's population by 20,000. However, congestion on the main access route has not stopped growth in Marin County, Contra Costa County or San Mateo County." It should be noted that the MTC I-580 study referred to indicated that access had a major impact on growth but not that it should be anticipated that growth would stop. The reason for this is that the Dublin Canyon is a constraint only on growth resulting from economic development in the East Bay and San Francisco. Growth can continue to occur based on economic development in other areas. The same reasoning applies to Marin, Contra Costa and San Mateo Counties.

Project Response

The MTC comment is correct and the referenced paragraph has been modified. (See page 11, proposed revisions.)

MTC Comment Seven

On page 67, it is stated that unless the discrepancy between the CALTRANS forecasts and RTTPP forecasts are resolved, there is no reasonable way to be certain whether BART would induce development. It is not clear how resolving the above issue would assist in determining the growth inducing impact of BART. The growth assumptions in the RTTPP projections were given and it would require a separate analysis to determine the growth inducing impact. The growth projections output by PLUM using the GROSOUTH assumption were modified by the consultants to reflect their assumptions of growth in the Valley. We need to know if the growth projections used were made on the basis that a higher projection is needed if an extension is being considered for the Valley. If that is the case, then the consultant has already assumed a growth inducing impact by BART. (See also a similar comment made in the Growth-Development Issues).

Project Response

Growth predictions were made on the basis of available land and anticipated governmental policies on growth. Population projections are discussed on page 22 of the Draft Final Report and are independent of whether or not BART is extended.

MTC Comment Eight

The IPD staff has raised the question, "Would the plan for expansion of I-580 through Dublin Canyon provide sufficient capacity for 1990 without a BART extension?" In this question is the implicit assumption that the population is independent of the transportation system. This is questionable. Instead, we should say that we anticipate that with the I-580 improvements, the limited bus service and other assumptions we anticipate a 1990 population of between 160,000 and 170,000. This figure is below the levels stated in the Valley development alternatives. If BART were extended to Livermore, the total population might be higher. Also, if employment develops at a faster rate in the Valley, or in the Fremont, San Jose, Walnut Creek or Tracy areas, then the population might be higher.

Project Response

This appears reasonable and consistent with statements in the Draft Final Report.

MTC Comment Nine

The validity of the Valley development alternatives will be discussed from three points of view: 1) the characterization of the population levels, 2) the relationship of the alternatives to transportation, and 3) the ultimate viability of transit.

First, the population figure of 178,000 for the Valley in 1990 is characterized as "low sharply-curtailed growth." This figure corresponds to the moderate to high growth rate associated with the GROSOUTH populations in PLUM Series II Forecasts. We now feel that what was a "low" forecast for Regional population in 1990 is more likely to be a moderate forecast due to continued low fertility and migration rates. Certainly forecast assumptions can be debated but it appears that the consultants may be using population estimates which will not be realizable.

Second, aside from the comments immediately above, the dependence of the forecasts on transportation and job location assumptions should have been spelled out more clearly so that the growth inducing effects of economic development and transportation to such development could directly be addressed. What are the transportation assumptions upon which a forecast population of 178,000 or 227,000 are based? Where will these people work?

Third, although there is some discussion on the effect on development of the amount of transit service available, there is inadequate treatment of the effects on development patterns of varying levels of transit acceptance. Generally, it is assumed that 40% of work trips would be carried by BART, perhaps this is too high. Would a lower modal split produce similar development patterns?

Project Response

Taking the comments in order:

First - While population growth rates have been revised downwards, the E-O projection for the study area shows 180,000 for the year 2000 rather than 1990 as used in the report. Since the project under discussion is a major investment with a long lead time, it would not seem to make a significant difference whether the population figure is reached in 1990 or 2000.

Second - The assumptions on population and travel are described on pages 6 and 7 as well as on pages 13 through 15.

Third - Mode split percentages were established by the RTTPP, not by the consultant. While it seems probable that a lower modal split would diminish the development influence, the consultant has concluded that such influence is already minor relative to other controls.

MTC Comment Ten

IPD COMMENTS

1. The development impact sections contain highly hypothetical statements (e.g., a given Valley population would require less land and would generate fewer VMT and traffic congestion with BART). While the statement is probably true, it serves to mislead rather than illuminate since it alludes to a state of affairs which is unlikely to occur. The report should concentrate instead on an examination of the probable extent and impacts of growth induced by a BART extension.

Project Response

The work program for the consultant contract, reviewed and approved by MTC, calls on the consultant to make recommendations on complementary public actions appropriate to increase the effectiveness of a BART extension (task 12). It is important to spell out what public measures are needed to realize the maximum potential from a major public investment.

MTC Comment Eleven

In the analysis of the station plans, CALTRANS 1995 projections were utilized rather than RTTPP Task III 1990 projections to show traffic volumes on streets in the vicinity of the stations. We need to know if any attempt was made to use RTTPP highway projections. If RTTPP projections were available (as suggested by Howard Goode) we need to know why the consultant adopted CALTRANS projections.

Project Response

A clarification of
proposed revisions to the

MTC Comment Twelve

11. Another assumption
Is that BART will ha
way congestion. Such
ported since the net
depends on the growth
line to carry the ri
and future growth

Project Response

The proposed revisio
been revised to reflect
of the proposed revisions

MTC Comment Thirteen

2. Environmental Impact

a. Socio-Economic Im

The report discuss
the rapid transit
Impacts. How woul
the handicapped
system could be
stant transit user
stant auto user.
gory and expressed
transit user could
travel time savin
insurance cost sa
the evaluation pr
MINIMIZE TOTAL DI
the poor, the ela
been assessed. Fo
development are n
recreation and cu
report does point
the suitability
poor and disabled
A to G. We need

Project Response

The initial portion
of the benefits associat
While the report does giv
for alternative modes, it
this information in some
approaches tend to overst
The third objective, on
a tool for comparing BART
evaluation of the desirab
the comment.

The impacts of the p
are expanded as described

MTC Comment Fourteen

3. Also on page 27, consi
indicate that the fre
to handle the additio
sion." However, the
that the two Fremont
peak hours (using a
Livermore extension.

Project Response

A clarification of this point is contained on page 3 of the proposed revisions to the final report.

MTC Comment Twelve

11. Another assumption made or implied on page 61 of the study is that BART will have an overall impact of reducing freeway congestion. Such an assumption is not clearly supported since the net effect of BART on freeway congestion depends on the growth inducement and the ability of the line to carry the ridership demand resulting from existing and future growth - including induced growth.

Project Response

The proposed revision of the text starting on page 61 has been revised to reflect this comment. (See page 10, 11 and 12 of the proposed revisions.)

MTC Comment Thirteen

2. Environmental Impact Issues

a. Socio-Economic Impacts

The report discusses in general terms most of the impacts of the rapid transit extension, except for the socio-economic impacts. How would the users, the non-users, the poor and the handicapped be impacted? The users of the transportation system could be classified into three categories: The constant transit-user, the diverted transit-user and the constant auto user. Benefits could be calculated for each category and expressed in dollars. For example, the diverted transit user could be analyzed independently by looking at travel time savings, parking cost savings, fuel savings and insurance cost savings. This analysis could then be used in the evaluation process for the third objective on page 21 - MINIMIZE TOTAL DIRECT AND INDIRECT TRAVEL COSTS. Impacts on the poor, the old, the young, the non-drivers should have been assessed. For these people the suburban patterns of development are not well served by transit. Jobs, schools, recreation and cultural opportunities are inaccessible. The report does point out in the 2nd objective on page 122, that the suitability of the selected route to serve the young, old, poor and disabled ranges from D to G on an ordinal scale of A to G. We need to know what suitability to serve includes.

Project Response

The initial portion of this comment suggests monetary evaluation of the benefits associated with the project, including time savings. While the report does give information on the travel time and costs for alternative modes, it appropriately refrains from aggregating this information in some sort of "cost/benefit" analysis. Such approaches tend to oversimplify and distort the evaluation process. The third objective, on minimization of travel costs, was intended as a tool for comparing BART and bus alternatives, not for some overall evaluation of the desirability of a BART or bus sustem as implied by the comment.

The impacts of the BART and bus systems upon transit dependents are expanded as described on page 13 of the proposed report revisions.

MTC Comment Fourteen

3. Also on page 27, consultants state: "Current BART projections indicate that the Fremont line will have sufficient capacity to handle the additional patronage from a Livermore extension." However, the OATAP Plan 3 Analysis (table 3) indicates that the two Fremont lines will be at or near capacity during peak hours (using a 1.5 load factor) by 1990 without a Livermore extension.

Project Response

The patronage information in the OTAP Analysis includes patronage from the Livermore/Pleasanton area, which reaches the existing BART line by means of highway I580 in either bus or cars. When RTTPP Test 1B (without LPX) and Test 2A (with LPX) are placed on a comparable population/employment basis, the BART extension appears to add only 2500 daily work trips between the study area and San Francisco and Oakland.

MTC Comment Fifteen

g. There will be some passengers who live within walking distance of a BART station. The probability that passengers would walk to their stations will depend on various factors: competing modes, directions of routes, freedom from physical barriers and delays such as busy road crossings, safety from traffic or other hazards, and freedom from noise and fumes. Some work could have been done in this area to provide some recommendations on how to minimize some of these adverse conditions so as to encourage walking. Similarly, cycling to the stations could have been considered and encouraged as an access mode.

Project Response

The considerations noted by this comment are appropriate to the detailed design of the extension, however they are not appropriate to the present study except in a very general way. The opportunity for encouraging non-motorized access modes rests with the ability to attract higher density housing to within walking distance of the station. This effect, which is discussed in the report, is more relevant at this point in the planning and design process.

MTC Comment Sixteen

3. Transportation System and Travel Issues

Most of the issues raised here relating to RTTPP projections have been discussed with Howard Goode, Project Coordinator for the BART District. He has agreed to look into this matter and clear the discrepancies or provide explanations.

a. The report points out on page 6 that 36,000 Valley residents will hold local jobs. Translating this into dwelling units, using an assumption of 3 residents per dwelling unit (consultants' assumption), you have 12,000 housing units that would be generating 120,000 trips a day in the Valley (using 10 trips per housing unit as given on page 18). Total intra-valley BART patronage is given as 5000 trips per day on BART. This leaves a substantial portion of trips using other modes of transportation (auto, transit, walk, etc.). Was there any analysis done to determine what effect this amount of trips would have on the local transit and street system? Where did the trip generation rate of 10 trips per housing unit come from, and what modes does it include?

Project Response

The scope of this project did not extend to the analysis of local traffic and its impact, except in terms of station access considerations.

MTC Comment Seventeen

b. On page 26, the report states that about 3000 trips bound for Bay Fair station originate in Castro Valley. Does it mean in Castro Valley or at Castro Valley station? If the report is referring to BART trips, Test 2A shows that the total productions from Castro Valley station for work is 919 and non-work 494. These are total productions to

all other stations on the network and thus would fall far short of the estimated 3000 trips bound for Bay Fair station. An analysis was carried out to determine the intra-valley travel patronage. Table 9 (page 26 of the report) gives the patronage as 2000 for work trips and 3000 for nonwork totalling to 5000 total trips. The following two tables show the results and what stations were considered as intra-valley. The work productions are 676 and nonwork 1642 productions. It must be noted that for work productions the return trip home is included, so the productions are total trips.

WORK TRIPS

	Dublin	Pleasanton	W. Livermore	E. Liv.	Total
Dublin N/W	0	30	40	36	106
Pleasanton	47	0	02	99	238
W. Livermore	97	114	0	14	225
E. Livermore	41	57	9	0	107
	185	201	141	149	676

NON WORK TRIPS

	Dublin	Pleasanton	W. Livermore	E. Liv.	Total
Dublin N/W	0	71	151	126	348
Pleasanton	0	0	158	167	325
W. Livermore	308	84	0	274	666
E. Livermore	185	55	63	0	303
	493	210	372	567	1642

Project Response

A proposed revision to the report which incorporates the above comments is included on page 3 of the list of proposed changes.

MTC Comment Eighteen

c. Air Quality Impacts

i. We would like to inform the study participants that MTC has developed and is in the process of improving the DIFKIN Photochemical air quality model. This model is now closer to being operational and usable for predicting potential air quality impacts of BART than are any of the models alluded to on page 65.

Project Response

A reference to the MTC model is contained on page 12 of the proposed changes.

MTC Comment Nineteen

ii. The air quality impacts are based primarily on the work done by CALTRANS in its I-580 DEIR. That work was shown to be inadequate and the BART Extension Study should not rely on it. In particular, the impact of growth and development in the Valley was not taken into account. The key air quality impact of BART is expected to be based on the emissions from development and intra-valley trips resulting from development that is induced by the BART extension. Furthermore, it is questionable whether BART will result in reduced auto use to and from the Valley. More likely, BART will result in additional non-auto trips to and from the Valley and additional auto trips within the Valley.

While there may be some disagreement about the CALTRANS 1-580 EIR, it has been accepted by the U.S. DOT. If growth is stimulated by BART, then some of the air quality gains associated with BART would be diminished and this effect is described in the new text on page 11 of the proposed changes. When a particular level of population and employment are considered, analysis of RTTPP figures indicate that BART does reduce automobile traffic to and from the valley.

Person Trips/Day

Test		Highway	Transit	Total
6	Bus*	106,560	20,740	127,300
2A	Rail	102,800	34,000	134,700

*Test 6 adjusted to Test 2A population and employment.

MTC Comment Twenty

iv. It is questionable that the BART extension will not encourage growth in outlying areas but rather will concentrate growth around the stations. The proliferation of parking lots near existing suburban BART stations indicates that such assumptions are weak. Relative to air pollution, this factor is very important; if the BART extension generates a large number of short trips to the stations, then its effect on reducing VMT would not be very significant. Additionally, these short trips will contribute to the "cold starts" and "hot soaks" aspects of emissions mentioned above.

Project Response

Beyond the park/ride facilities provided by BART, project staff is unaware of a "proliferation" of parking lots around stations.

BART's effect on VMT is a function of the trips which are diverted to BART. If the same trip was previously made by auto, then a VMT reduction takes place even when the car is used to access the station. Cold starts are discussed on pages 66 and 104 of the draft Final Report.

MTC Comment Twenty-One

e. In looking at the patronage in the Dublin Canyon corridor, the consultant utilized Test 2A (high growth assumption) and based the revenue calculations on this patronage. It is appropriate to estimate a range of future patronage and revenues based on a range of growth assumptions rather than rely on one assumption. Test 2B, which assumes lower growth, could be looked at for this purpose. The patronage through the Dublin Canyon for this test is approximately 28,600 compared to the 34,000 estimated in Test 2A. Revenue implications of such a lower patronage level should be included.

Project Response

The following paragraph should be added to the text on page 99.

"BART operating subsidy requirements are less sensitive to demand levels than is true with a bus system. With BART demand variations are met by changing train size while with buses, both the number of vehicles and drivers is modified. If patronage in the Livermore-Pleasanton corridor is lower than forecasted, then the subsidy requirement for BART increases while that for the bus remains about the same."

MTC Comment Twenty-Two

f. In studying the bus alterna... buses could have been inclu... of buses, particularly when... is that added passengers ... costs, whereas longer trai... the same number of passeng... would increase the passeng... tially reduce costs.

Project Response

While this comment is ... experience with these vehicles ... estimation hazardous. Such ... memos on the subject are in the...

MTC Comment Twenty-Three

h. It is not clear why objec... on page 122 is not used ... selection of the "blue ri... tive.

Project Response

See page 13 of proposed ... where an explanation of why ... separately.

MTC Comment Twenty-Four

2. On page 27, Daly City is ... at which trains could be ... ence to building a fourth ... Please check the validity ...

Project Response

The statement on Daly ... that point, with capacity nee... extension of all BART transbay ... track through the Oakland Wye ... not that it would be.

MTC Comment Twenty-Five

d. The report states on page ... person trips through Dubl... This estimate does not ag... Table 19, page 95. These ... tent.

Project Response

Page 26 should read, 10...

MTC Comment Twenty-Six

b. The legend for the map ...

MTC Comment Twenty-Two

f. In studying the bus alternative, the study of articulated buses could have been included. One of the disadvantages of buses, particularly when passenger volumes increase, is that added passengers mean more drivers and higher costs, whereas longer trains can be operated on rail with the same number of personnel. Clearly bigger buses that would increase the passenger/driver ratio could potentially reduce costs.

Project Response

While this comment is potentially correct, insufficient experience with these vehicles in this type of application makes estimation hazardous. Such buses were studied briefly and technical memos on the subject are in the project files.

MTC Comment Twenty-Three

h. It is not clear why objective 3 in the evaluation process on page 122 is not used in the final evaluation and selection of the "blue line route" over the bus alternative.

Project Response

See page 13 of proposed changes in the draft Final Report, where an explanation of why travel cost savings were not calculated separately.

MTC Comment Twenty-Four

2. On page 27, Daly City is referred to as an intermediate point at which trains could be turned back. There is also a reference to building a fourth track through the Oakland Wye. Please check the validity of these statements.

Project Response

The statement on Daly City assumes extension of BART beyond that point, with capacity needs on a San Mateo line not requiring extension of all BART transbay lines. The reference to a fourth track through the Oakland Wye states that it could be constructed, not that it would be.

MTC Comment Twenty-Five

d. The report states on page 26 that estimated 1990 highway person trips through Dublin Canyon is 101,000 with BART. This estimate does not agree with the 103,000 shown in Table 19, page 95. These figures should be made consistent.

Project Response

Page 26 should read, 103,000.

MTC Comment Twenty-Six

b. The legend for the map on page 5 is not clear.

Project Response

A printing error was made and blocked out in the legend and this may be the cause of the comment. It will, of course, not appear in the final version.

MTC Comment Twenty-Seven

c. The appendix - Data Zones on page 119 is missing a correspondence table that links the Study's 86 zones to the corresponding 290 and 440 zonal systems. We would like to see such a table included or a reference made as to where it can be found in other study documents so that future reference to the Study's data base can be related to the regional data base.

Project Response

See page 15 of proposed changes.

MTC Comment Twenty-Eight

5. On page 107, reference is made to "MTC's 20-year Transit Development Program." The Transit Improvement Program (formerly the Transit Development Program) has a 3-year time frame. The Regional Transportation Plan has a 10-year estimate of regional needs and planned expenditures.

Project Response

See page 14 of the proposed changes.

PARTICIPATING FIRMS

LIVINGSTON AND BLAYNEY, CITY AND REGIONAL PLANNERS
Project administration, planning alternatives, land use, economic, and environmental impact analysis, and implementation program.

John A. Blayney, Project Manager for the Joint Venture
Roy H. Cofer, Project Planner
Michael V. Dyett, Project Planner
Chad Michel, Planning Delineator
Eva Bartlett, Report Typist

DE LEUW, CATHER & COMPANY, ENGINEERS AND PLANNERS
Transportation planning, conceptual engineering, cost estimating, and implementation program.

James W. Schmidt, Chief Project Engineer
Hans W. Korve, Project Engineer
Thomas H. Meeks, Design Engineer
George W. Mitacek, Transit Planner

FREEBAIRN-SMITH AND ASSOCIATES, PLANNING, URBAN DESIGN, ARCHITECTURE
Evaluation of visual and physical fit of BART routes and stations and urban design potential.

Rod Freebairn-Smith
Victor Chapman
Janet Crane

KEYSER/MARSTON AND ASSOCIATES, ECONOMISTS
Preliminary economic analysis at points of connection to existing BART system and at alternative Valley station sites.

A. Jerry Keyser, Partner
Timothy Kelly, Associate
Fred Norbury, Associate
Ernest Loo, Economist (Larry Smith & Company)

GRUEN GRUEN + ASSOCIATES, SOCIOLOGICAL CONSULTANTS
Household survey of community attitudes toward BART and urban development alternatives.

Nina J. Gruen, Principal Sociologist
Roberta A. Mundie, Planning Analyst

WILLIAM GOLDNER, URBAN PLANNING CONSULTANT
Evaluation of Projective Land Use Model (PLUM) application to BART development impact assessment.

ROBERT H. TWISS, ENVIRONMENTAL PLANNING
Natural environmental impact assessment.

WOODWARD-CLYDE CONSULTANTS, CONSULTING ENGINEERS AND GEOLOGISTS
Geologic and soils studies of final alternatives.

David J. Gross, Senior Project Engineering Geologist
William R. Hansen, Senior Project Engineering Geologist
John Alt, Senior Staff Geologist

ESIGN, ARCHITECTURE

ding

TS
rban

to

RS AND GEOLOGISTS

153810